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THE BRICKBUILDER

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THE BRICKBUILDER.

AN ILLUSTRATED MONTHLY DEVOTED TO THE ADVANCE-
MENT OF ARCHITECTURE IN MATERIALS OF CLAY.

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THE building law of the city of Boston has for years prescribed that no portion of a building shall project beyond the property line without special permission obtained through certain designated channels. By common practise it has come to be understood that this restriction applies only to portions of the actual building, and not to string-courses, pilasters, belts, etc., and up to a very short time ago projections even of considerable size, which started from a height of not less than 7 or 8 ft. from the ground, even though they bodily overhung the street line, were not considered infractions of the law. This was common practise rather than by statute law, however, and as the building ordinances distinctly stated that no projections whatever should be made beyond the street line, it was quite natural that such regulations should give an opportunity for differences of opinion as to the right of even a cornice to overhang the street. A case occurred only a short time ago in which the owners of a certain large building were absolutely prohibited from projecting the cornice, though this prohibition was subsequently removed and the cornice was built as originally planned. When the Brazer Building was started in this city, and before the cornice was reached, a protest was made by an adjoining property owner against any projection of the cornice, which, while by no means as pronounced as many other cornices of existing buildings, was planned very naturally to project beyond the line, and this projection, if considered in the light of the letter of the law, was not permissible. The objections which were raised led to considerable strong feeling, and by a proposed compromise the total projection of the cornice, which was of terra-cotta, was to be reduced from 2 ft. to 9 ins. As one of our daily papers well stated, logically followed out, the law, according to the city solicitor's construction, would stop all cornices,—the most im-

portant and often the only redeeming architectural feature in the modern city sky scraper,—all belt courses, all ornamental features, one may almost say, in the down-town commercial building, reducing it to the mere dry-goods box it is so often caricatured as being.

Such a rigid interpretation of the law is so manifestly unjust that its enforcement was bound to bring about its repeal; and a new law has just gone into effect which is in some respects better than the old uncertainty in that, distinctly recognizing the fact that the cornice of a building must project, it sets a limit of 3 ft. to such projection. In regard to the construction of cornices, the law states that if of stone, each stone shall balance on the wall, which certainly is a wise and a necessary restriction, but it is discreetly silent in regard to the construction of terra-cotta cornices, the details being subject to the approval of the building commissioner, who, without laying down urgent laws, has always advocated that terra-cotta should, where practicable, be constructed in the same manner as stone, that is to say, should be balanced fully on the wall. The introduction of the steel skeleton, which is an admitted fact in the construction of nearly all large buildings, has made it possible, however, to enormously reduce the quantity of useless terra-cotta, which would be required if every block were to run clear through the wall and balance on the other side, and by a judicious employment of steel framework it is now possible to cut down the depth of terra-cotta, to a minimum, at the same time obtaining a greater security and a more rigid construction than would have been possible without the use of steel. Our constructors have been slow to accept the possibilities of the framed cornice. Although this is a logical and perfectly natural outgrowth from the skeleton construction, the custom of years, the habits of construction which have survived so many changes in style, have operated to produce a timidity in the projections, an unnecessary clumsiness in construction, which can be entirely avoided if we once recognize frankly the possibilities of a framed construction, and proceed scientifically to hang all the terra-cotta work onto the frame. The laws and the practise in regard to this construction are not yet fully determined, but the Brazer Building, previously referred to, will have a strong influence in determining the point of view in the future. The cornice on this building as originally planned was admirably framed; there was no useless terra-cotta, and while full projection was obtained, and not the slightest sacrifice made to artistic effects, it was structurally and scientifically correct. The cornice which is now on the building in place of the one originally designed is equally well constructed, though with not so much projection, and with corresponding loss, we fear, to the general effect of the building. The illustrations which we have published of late of the various constructions for projecting terra-cotta work have served to show how some of our best constructors handled a problem of this sort, and if there were more such examples in actual practise, if we would persistently regard terra-cotta as an envelope to be clothed upon a steel frame, to treat the terra-cotta in its purely decorative spirit, ornamenting the construction rather than undertaking to construct the ornament, our public architecture would be the vast gainer thereby. Stone is too heavy to be used to advantage for projections of a steel frame building. It cannot be molded around the supporting members, it must thoroughly balance on the supports as well as be tied back to them, and it is much more expensive to set in place even if the structural difficulties could be overcome. It goes without saying

that all terra-cotta cornices are not well constructed. Indeed, notwithstanding the balancing traditions, there have been several instances where terra-cotta projections have been carried to an extreme which has resulted in failure, but such failure has resulted almost entirely from attempts to diminish the thickness of terra-cotta without the use of steel framework, which is an impracticability.

There is a point to be considered in connection with projecting terra-cotta members of a street front which might easily be neglected. The terra-cotta work must not only be properly hung to the steel frame, but must also be so constructed that it will be secure against a pretty considerable blow from the outside. In case of a fire the firemen would naturally attach their ladders to the cornice. The force of a stream of water delivered from one of our heaviest modern fire engines, if at close range, would be something like 250 or 300 lbs. per inch. If the terra-cotta is made of slight thickness or is not securely held in place, it is liable to be cracked by the weight of the ladders, or even shattered by the impact of the water from the hose. In either case the result would mean a destruction of the cornice and danger to the firemen below.

Our building ordinances practically do not recognize the existence of a steel frame, at least not in this city, and all of the large buildings which have been erected within recent years have been built under a species of official tolerance rather than by direct accord with the wording of the law. Our statutes still continue to prescribe the thickness of wall for a building carried to a height of 125 ft., when as a matter of fact there has been hardly a building erected within the last five years with a wall of a height of even 50 ft.; and considering the success which has attended the introduction of the modern construction, the facilities for the use of brick and terra-cotta in an intelligent and workmanlike manner, it is high time that our laws should recognize the new construction, and the statutes be changed accordingly.

WE present with this issue the façade of three dwellings designed by Marcus T. Reynolds, of Albany, for the Van Rensselaer family, and erected on the principal residential street of that city, not far from the park entrance. While the building contains three separate residences, the connection between the several owners permitted, and the importance of the situation demanded, a more imposing palatial effect than would have been possible had each dwelling been treated as an entirety. The architect's aim in this respect must have been steady and deliberate, for he has attained the desired end with more than ordinary success.

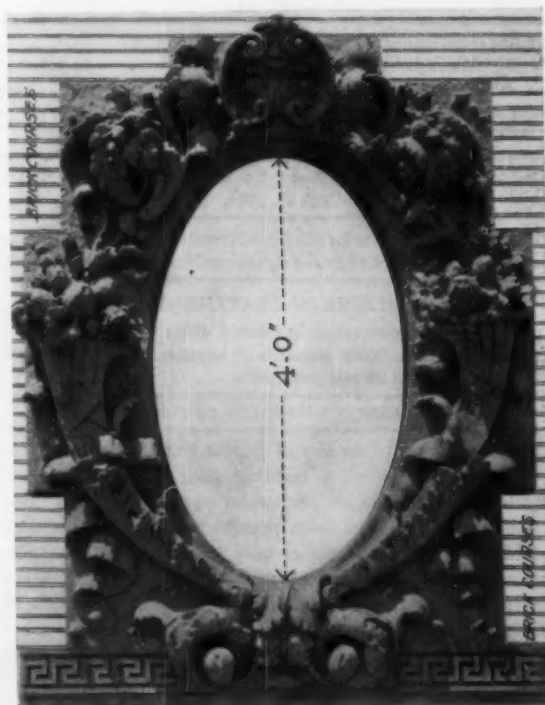
The first story is executed wholly in terra-cotta blocks of two designs; one course being rusticated, with a vermiculated surface; the alternating courses having a reticulated pattern in low relief. With the exception of the mullions and spandrel panels in the second story windows — which are dark-red Verona marble — the architectural features of the two upper stories are likewise in terra-cotta, with Roman brick of exactly the same shade of golden buff for all plain surfaces. The second story windows resemble the characteristic double-headed windows of the early Florentine palaces. In those of the third story a square opening is surrounded by a rich architrave on which rests an entablature with a garland of fruit as the frieze. The pediment recedes towards the wall, in keeping with the ornate but unobtrusive character of the adjoining ornament, and suggesting a pediment more by its triangular shape than by its treatment. The sky line has not, in this case, been disfigured by any crowning abomination in galvanized iron, painted, and sanded with transparent artifice and fraudulent intent. The main cornice is terra-cotta. Clusters of acanthus alternate with baskets of flames along the frieze. Indeed, from the repeated use of flames as a motif on this particular building, we infer that they must have some especial significance — perhaps the crest of the Van Rensselaer family.

Mr. Reynolds seems to have studied to some advantage the many beautiful examples of terra-cotta architecture that abound in the palaces and churches in the valley of the Po. With the work of

many generation of artists, in an artistic age, to draw from, he has wisely refrained from the invention of a new style. He has, however, sought to begin where they left off, and to carry terra-cotta architecture a step further by careful study, and a close observance of its capabilities. A laudable effort has likewise been made to show that the attributes of this material are different from those of stone, and that they demand a distinct treatment. The candor and consistency displayed in this is quite refreshing — a veritable oasis in a desert of sham and imitation. Whether it be in the choice of color, the peculiarity of finish, or the style of detail employed, the architect has made it plain that burned clay is the material; that it stands on its merits, that it needs no apology, and that it refuses to be considered an imitation of stone. It is on the fulfilment of these conditions that the future of terra-cotta depends, and on this basis that its ultimate destiny must rest.

ILLUSTRATED ADVERTISEMENT.

THE New York Architectural Terra-Cotta Company send us the adjoining illustration of an elliptical window. The photograph was not taken from the model, but from the actual work as it



came from the kiln, and is therefore a real, as distinguished from an ideal representation.

PUBLISHERS' ANNOUNCEMENT.

OWING to the length of Mr. Wight's detailed account of the Pittsburgh Fire, which, because of its importance in demonstrating the value of the present methods of fire-proof construction, we feel justified in printing in full in this number, we have been obliged to hold over until July, Mr. Cusack's next instalment on Architectural Terra-Cotta.

MR. CUMMINGS's series on American Cements terminates with this issue of THE BRICKBUILDER. At an early date this work will be published in book form, which will comprise two very interesting chapters in addition to those which have already been printed in these columns. Due notice will be given of the date of publication.

Terra-Cotta Cornices for Steel Skeleton Buildings.

BY W. L. B. JENNEY.

AS terra-cotta is the material best adapted to the street fronts of the steel skeleton, lapping around the horizontal flanges, easily secured and fire-proofing the steel, the terra-cotta cornice is in general use in high buildings. The essentials are:—

That the terra-cotta shall be very securely and substantially supported and anchored. To this end the steel and the terra-cotta must be designed together. All supports and all anchors must be shown on the designs, that the holes in the terra-cotta and in the steel may be made in advance, and the anchors provided. Usually there is a portable forge at the building for heating rivets, where the lengths and shapes of the anchors may be adjusted to fit correctly as the terra-cotta is set.

Strong Portland cement mortar only should be used; the outer one or two inches the color of the terra-cotta. Unless Portland cement is used, the mortar joints will be affected by the frost and ere long fall out, and water will enter, freeze and displace, or break, the terra-cotta.

All terra-cotta should be reasonably straight and hard burned.

The examples shown are from the finest types of office buildings. They are reduced from full-sized working drawings and are exactly as constructed in the several buildings respectively.

It will be seen by inspection that the supports and anchors vary greatly with the design of the cornice, and when it is a question of economy, this should be kept in view in designing the cornice. Other things being equal, the cost increases with the projection. It is desirable, whenever practicable, to consult with the terra-cotta company before the details are finally settled, as they must furnish and set the material, and sometimes very valuable suggestions can be obtained from them contributing to the stability and economy.

An old French professor in the Ecole Centrale at Paris was fond of telling his students, "Never lose the opportunity to consult with those who know more than you on any subject, and remember that an intelligent foreman often possesses practical knowledge on some minor points not found in the books that may be of great benefit to the professional architect and engineer."

This is quite likely to be true in terra-cotta cornices. The terra-cotta must be molded, baked, and set, and if the facility for doing these three things is kept constantly in view in designing the cornice, the most substantial and the most economical cornice will be obtained. It is often easy to add to the stability, and to diminish the cost by chances that do not injure the architectural effect.

Discussion of the examples presented:—¹

TRUDE BUILDING:—

This is for an ornamental cornice—a reasonably simple one. The minimum projection beyond the building line is 3 ft. This projection is supported by a system consisting of steel ells nearly vertical, extending from the level of the attic floor upward about 4½ ft., and outward to the building line or face of the vertical wall, and secured at the ends by gusset plates to the I beams, at about the attic floor level, and to the horizontal 4 by 4 ells, forming cantilever that with the longitudinal ells forms the main support of the extreme projections. The system is tied back to vertical ells against the inner face of the outer wall of the building. The two lower terra-cotta members shown in the designs are the window caps. They should be filled with concrete. Particular care is required. The work is set from outside scaffold. The filling is partly in advance and partly after anchors are in place, as may be in each case found most convenient. It is easily seen that the anchors must fit with exactitude.

¹ See plate page 116.

In this example, below the cap members there is no filling of the terra-cotta outside of the face of the outer wall of the building. The inner and upper cap member rests on a longitudinal brick ledge and should be filled as far as practicable in setting. For filling there is nothing better nor more convenient than good Portland cement mortar and broken terra-cotta.

The extreme outer members are not filled. The coping of the parapet wall should be filled. In this case, it would be advisable to build short 9 in. walls in the center of the parapet wall, and of proper height and length to allow the pieces of coping to be set in place. The proper amount of cement mortar is filled into the coping before setting, that the coping may be substantially full. Every care and precaution that ingenuity can suggest must be exercised to prevent the entrance of water within or between the pieces of terra-cotta. To this end it is best to fill every piece whenever practicable. Every joint must be filled over the entire surface with best Portland cement, and clean, sharp sand, equal parts and thoroughly mixed. A thorough mixing is more important than is generally supposed. At length this matter is attracting the attention of engineers and contractors, and machine mixers are now being used. Recent tests made by Ransome with one volume of Portland cement and three of sand showed a very decided improvement in machine mixed over the usual hand mixed.

All joints that come to the surface must be scraped out and thoroughly pointed with Portland cement used neat, or with not to exceed equal parts of the best, fine, sharp sand; coloring added where necessary. In special cases, caulking with oakum or flashing with metal is to be recommended; in fact, no precaution available should be neglected, as the introduction of water within a terra-cotta cornice in freezing weather may produce most serious accidents, displace and break pieces which by falling might result in loss of life.

FORT DEARBORN BUILDING:—

In this example very little steel is required, and is a good example of how to build a showy, deep cornice at minimum expense. The risk of leakage into the cornice is also reduced to the minimum, the only exposed joints being the cross-rolled joints between the pieces in the cap course.

If every piece in this cornice were filled as it should be, this example is very substantial, leaving little to desire in that respect.

THE FAIR BUILDING:—

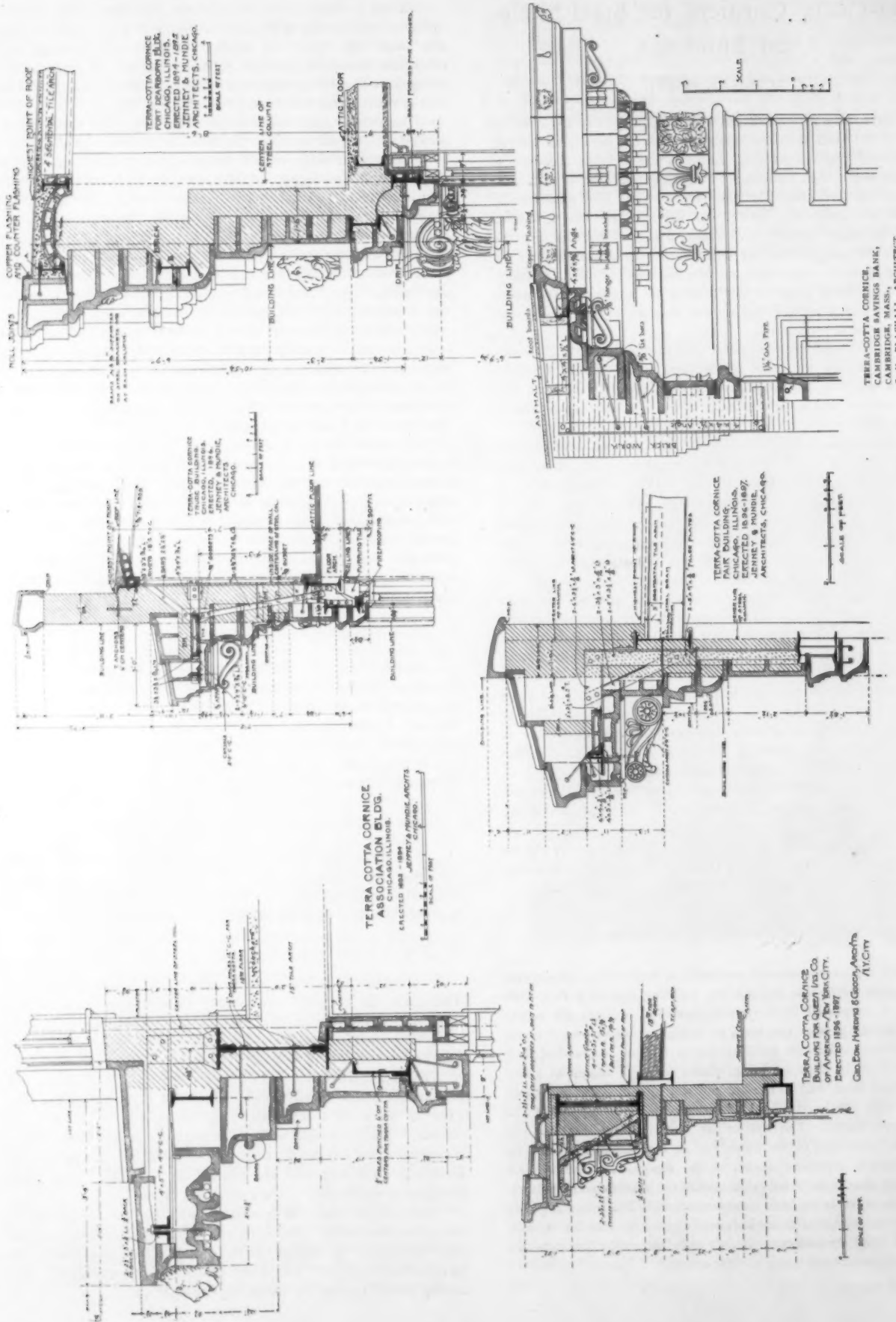
In this example, the system of steel supports is similar to that used in the cornice of the Trude Building, and there is but little to add. It is certainly desirable to build the supports strong enough to allow the cap to be filled, certainly the inner section.

THE ASSOCIATION BUILDING:—

This example is located below the attic story and tile roof. The sills to the windows above cornice might have projected with a drip beyond the face of the wall. The masonry, however, is so solid below that it is not essential. The longitudinal joints between the two cap pieces require special attention.

The filling of this cornice should extend out beyond the wall line, completely filling the lower courses and filling out to the outer edge of the outer I beam, carrying the cantilever in the upper courses. The ornamental soffit, as in some of the other examples, is suspended to the cantilever beam by concealed iron hangers. This method is often employed and offers little difficulty. It is easily managed by mechanics, who are otherwise capable.

Terra-cotta cornices in general require expert knowledge and the best of workmanship. None but the most experienced and reliable workmen should be employed in the setting. The terra-cotta should be rigorously inspected, and every defective piece discarded. The setting should receive the closest superintendence.



TERRA-COTTA CORNICES FOR STEEL SKELETON BUILDINGS.

THE RECENT FIRE AT PITTSBURGH.

A REAL TEST ON A GREAT SCALE OF FIRE-RESISTING CONSTRUCTION AND MATERIAL.

BY PETER B. WIGHT.

ON the evening of the 2d and the morning of the 3d of May there occurred in the city of Pittsburgh a serious fire, which is no longer a matter of news, but rather one of great public interest. There was a great property loss in the aggregate, which fell mostly upon the underwriters, said to be from \$2,000,000 to \$3,000,000. But that will depend upon what they agree with the owners to be the damage to several intentionally fire-proof buildings. The main interest taken in this fire centers upon the part sustained by three new buildings in which modern fire-proofing methods were employed, as well as a fourth, which escaped without more injury than broken glass, and a fifth with a broken roof. Of these four were fire-protected mainly according to one system, while the fifth differed from all the rest; yet all were different in some respects as to construction, and the circumstances of exposure differed in every case. They will serve as the basis for comparison of methods and materials in the experience of actual and, in some parts, crucial tests, to which the most improved methods of building have never before been so exposed as to amount to a demonstration. It is doubtful if either of these buildings would have been so seriously damaged had the fire originated within it, and the fire department been promptly called, in which case the event would not have attracted more than passing comment. It has always been supposed that the greatest danger to

buildings is from fire within, and that fire-proof buildings are competent to protect themselves, on account of the incombustible nature of their materials, from fires in adjoining buildings, or across the streets, without resorting to the methods employed to keep fire out of others which make no pretensions to being fire proof. The experience of the Pittsburgh fire has shown that a failure to provide against this unforeseen danger exposes fire-proof buildings in certain localities to tests of a severity never before anticipated.

Hence the proprietors of THE BRICKBUILDER have considered the occasion to be a proper subject for critical examination. At their request the writer visited the scene of the fire on May 25 and 26, a little more than three weeks after its occurrence, and before the buildings had been repaired to such an extent as to obliterate any of its effects.

The fire started in the wholesale grocery house of T. C. Jenkins, which runs through from Liberty Avenue to Penn Avenue, a distance of 236 ft., had a frontage of 87½ ft. on Liberty Avenue, between other stores, and of 150 ft. on Penn Avenue, between a brick dwelling and Cecil Alley, where it had a frontage of 107 ft. This store, it will be seen, was L shaped, six stories and basement in height, and covered 28,675 ft. of ground. It was in open lofts on every story with the exception of a section of 62 by 35 ft., which was partitioned off by a brick wall. It had about ten elevators. No attempt had been made to fire-proof it, and the construction throughout was with oak posts and girders and ordinary floor joists without any plastering. It was stocked with goods of the most combustible character, usual with wholesale groceries, from basement to attic, including a large stock of oil and sugar, as well as wooden ware. A switch track from

the Pennsylvania Railroad in Liberty Avenue entered the building. There were standard shutters on the Cecil Alley front as well as on the court that enters from it. The general plan and location will be seen on the map, Fig. 1, together with that of all the other buildings exposed and affected in any way.

The Jenkins building was totally destroyed, as well as two 20 by 112 ft. four-story stores on the east, fronting on Liberty Avenue, and another of the same size on the west, fronting the same street. A dwelling on the opposite side of Penn Avenue was also totally destroyed. One other store on Liberty Avenue was damaged, as well as two dwellings west of the Jenkins store on Penn Avenue.

Three other buildings, which are now special subjects for consideration, were damaged in different degrees. These are James Horne & Co.'s new six story and basement department store on the corner of Penn Avenue and 5th Street, fronting 120 ft. on the former, and 175 ft. on the latter, and 112 ft. high;

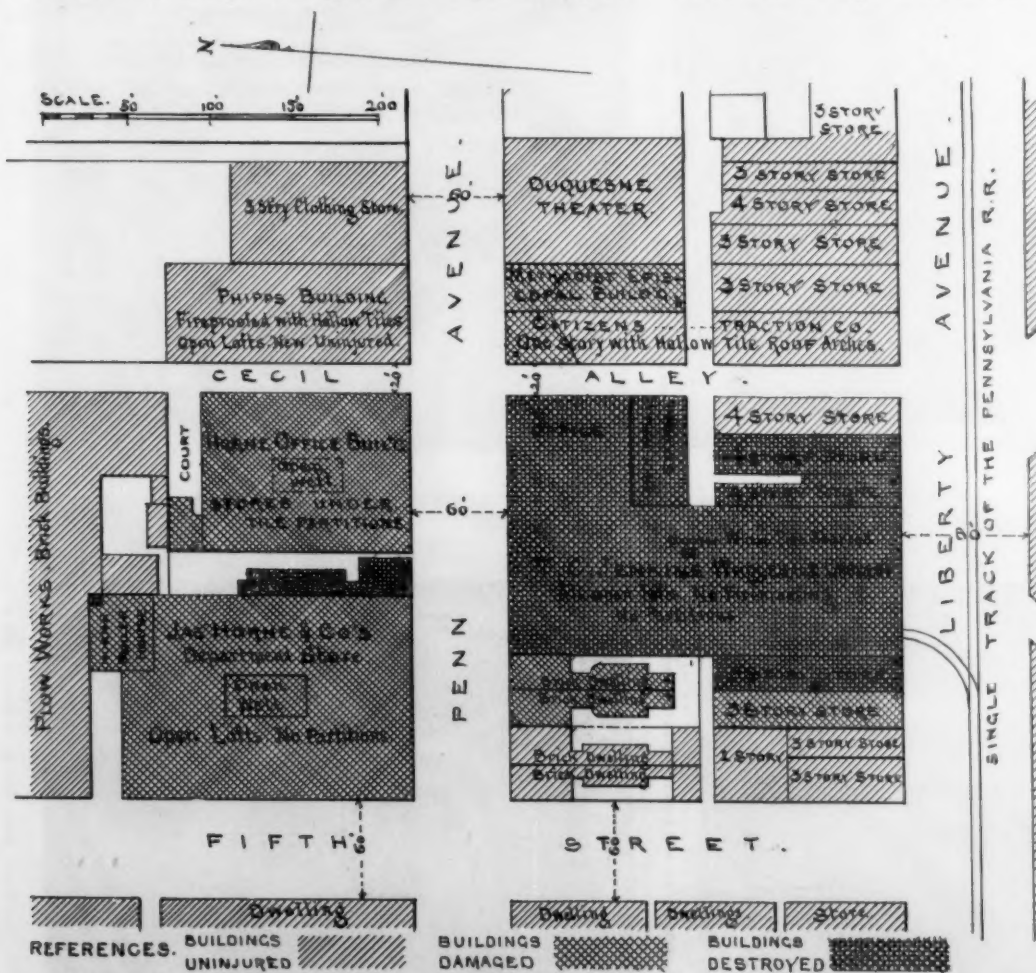


FIG. 1.—Map showing buildings at Pittsburgh, Pa., affected by the great fire of May 2 and 3, 1897. The fire started near base of elevator, near center of Jenkins Building, where marked.

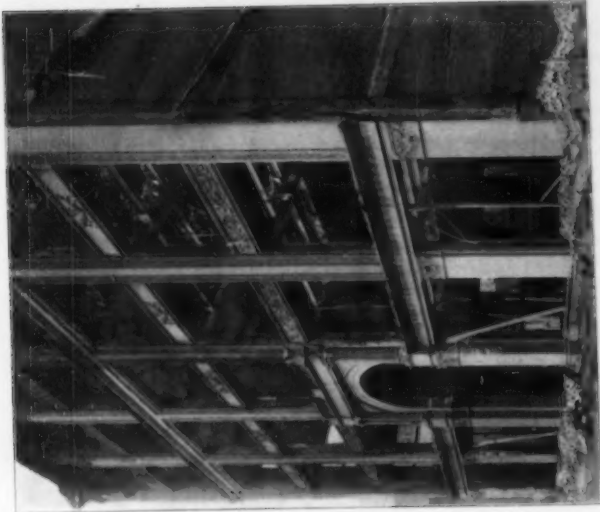


PLATE 3.—Showing front of Horne Department Store and floor arches knocked out through fall of roof, caused by fall of water tank. Beams and girders uninjured except in roof.

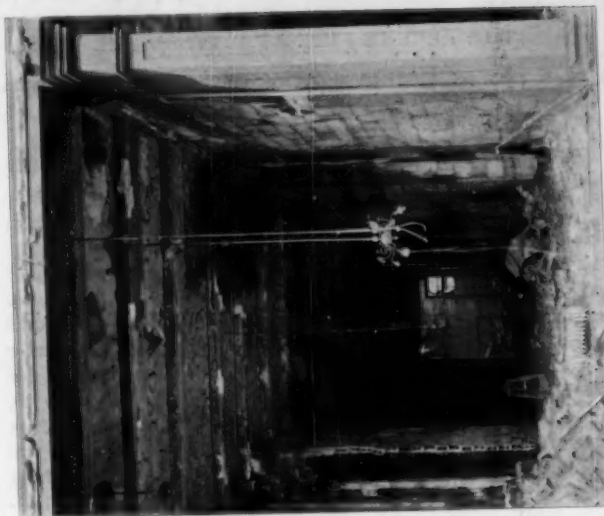


PLATE 6.—West store on Horne Office Building, showing end-pressure hollow-tile floor arches after the fire.

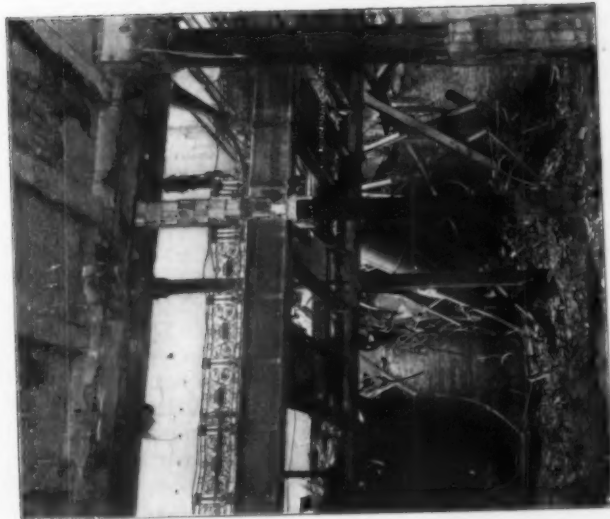


PLATE 2.—Horne Department Store, showing water tank that crushed through to the first floor, carrying roof, girders, columns, and floors, as well as destroying four passenger elevators and one stairway.

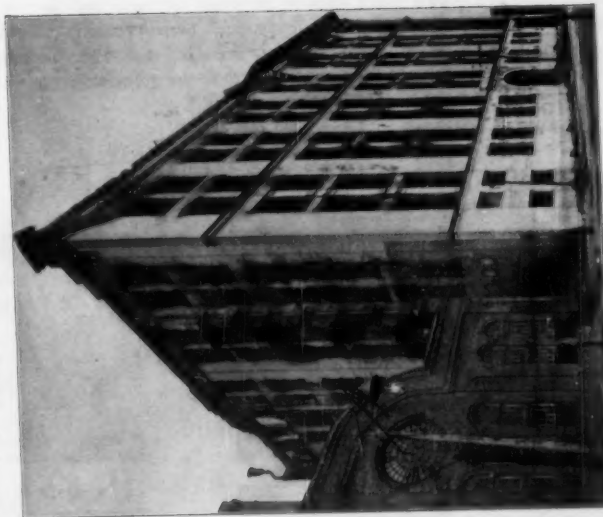


PLATE 5.—Side and rear of Horne Department Store, showing where riveted roof girder pulled out column in rear wall caused by fall of water tank.

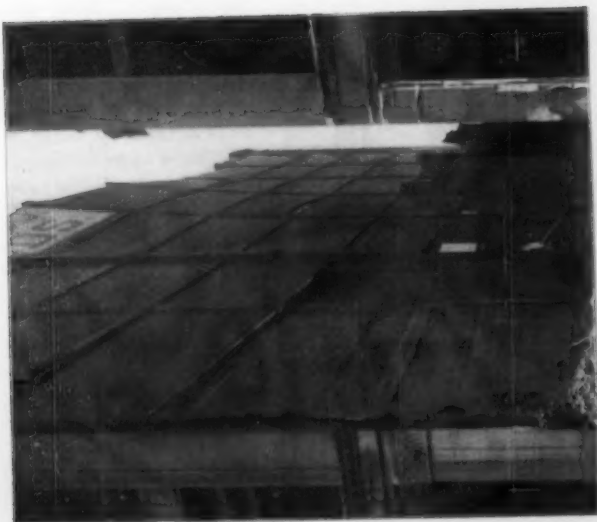


PLATE 1.—Showing east wall of Horne Department Store, a steel skeleton covered and enclosed with brick, which bulged out two feet at the top, where the fall of a water tank and floor beams deprived it of lateral support.



PLATE 4.—Horne Department Store, looking up through light shaft, showing general condition after fire.



PLATE 7.—Interior of Home Department Store, looking south on third story, showing general condition of the interior and wood floor and sleepers burned completely out of the concrete ballast.

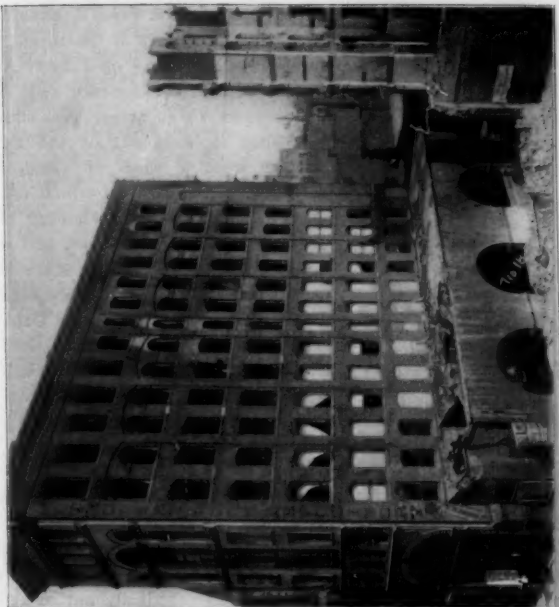


PLATE 8.—Methodist Episcopal Building with Citizens' Traction Company one-story building, where the fire stopped on the east. Ruins of Jenkins Building on the right.



PLATE 9.—Fronts of Home's Department Store and Home's Office Building, showing gap made in roof of the former through riveted girder, being pulled down by fall of water tank. Seen over ruins of Jenkins Building.

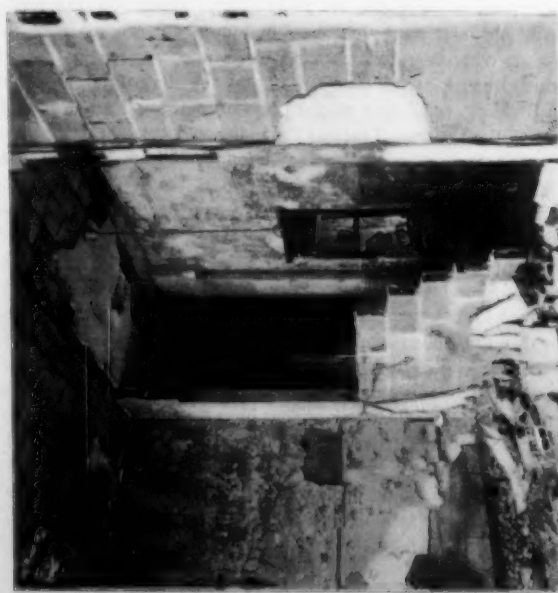


PLATE 10.—Home Office Building, front room in fourth story, showing perfect ceiling tiles and damage to partitions caused by use of wooden frames.



PLATE 11.—Methodist Building, eighth floor, showing ceiling of expanded metal and plaster on A, trons and partitions of wooden studs, expanded metal, and plaster.



PLATE 12.—Methodist Building, seventh floor, showing concrete ceiling and 20 in. I beams covered with expanded metal and plaster.

the four-story and basement Horne store and office building, fronting 95 ft. on Penn Avenue, and 125 ft. on Cecil Alley; and the eight-story and basement Methodist Episcopal Building, fronting 31 ft. on Penn Avenue, and running back 113 ft. to a rear alley or court. In addition to these the new six-story Phipps Building, fronting 60 ft. on Penn Avenue, and 145 ft. on Cecil Alley, was exposed to fire from the Horne store and office building, but saved by the firemen and its own steel and hollow-tile construction, except as to its broken glass windows. This building had lately been completed and was unoccupied, hence there were no goods in it to increase the risk. The building of the Citizens' Traction Company is a covered way over the tracks of the electric railroad, being the first story of what was once intended to be a high fire-proof building. It is 25 by 236 ft., cut into two sections by the alley running out of Cecil Alley. (See Plate 8.) The walls are brick, and the floor above, which also supports the roof, is of steel beams and hollow-tile arches. There is no plastering or woodwork in the building. The east wall of the north half is the base of the west wall of the Methodist Episcopal Building, which, above the first story, is pierced with windows, which have no shutters. There are, however, standard shutters on the rear, and in the wall overlooking the Duquesne Theater.

Cecil Alley is 20 ft. wide, to which, adding the 25 ft. of the Traction Company, we find that the Methodist Building is 45 ft. from the Jenkins store, on which were standard shutters. Penn Avenue and 5th Street are 60 ft. wide, and Liberty Avenue is 80 ft. wide. Accounts generally agree that there was a light wind from the south and east, to which the fire added impetus.

THE COURSE OF THE FIRE.

With the above explanation of the situation, the reader will be enabled to understand the course of a conflagration that was to put to the test some of the latest efforts of the constructors of fire-proof buildings, including architects, engineers, manufacturers, and users of fire-resisting material. Here was a huge burning structure of the most combustible character, filled with everything necessary to make a great fire, with uncovered windows on the north and south sides, and many elevators to carry the fire from floor to floor. On the north, northeast, and east were four new buildings, constructed with incombustible materials, and intended to be fire-proof, while that to the eastward had a barrier between it and the fiery furnace of the Jenkins Building, consisting of the one-story uncompleted fire-proof structure of the Citizens' Traction Company. Between this and the grocery was a 20 ft. alley, and the other four buildings were on the opposite side of a 60 ft. street. Behind two of them was an extensive plant of low brick buildings for manufacturing purposes extending to the Allegheny River. East of the group was the main business center of the city of Pittsburgh, and the nearest buildings were all of a highly combustible character, including a theater. That this group proved to be an effective barrier to the spread of fire in two directions is the universal opinion of all who saw it, is sufficient honor for those who were concerned in their erection, and a complete vindication of the modern and purely American systems of fire-proofing from the doubts and aspersions that have been cast against them. One of these buildings, the Horne Department Store, is of steel skeleton construction throughout, and is the first building of that kind ever tested by an actual fire which permeated every part of its interior. Though not as high as many others that have been built,

it had conditions of exposure which it would be difficult to discover elsewhere; and while this gigantic test is a vindication of the main features of the system, it is not to be intimated that all of these buildings were without faults of construction and planning. But such faults as they have can be easily remedied in the future, and the lesson they convey is one which we now have the privilege to study and profit by. The value of burned clay in protecting steel constructions, however defectively used, has been fully demonstrated in what all admit to be a crucial test.

From information obtained from the authorities of the Fire Department of Pittsburgh, I am enabled to give some idea of the duration and severity of the test. The first alarm was given at fifty-seven minutes past eleven on the night of May 2, and the second alarm followed five minutes later. The third alarm was at 12.04 on the morning of the 3d, and the fourth at 12.33. How long the fire had been in progress before the first alarm is not fully known, and is of no special interest. It started, as has been said, near the center of the Jenkins Building and spread in every direction. In forty-three

minutes from the first alarm, or at 12.40 A. M., the entire building was a mass of flames, which suddenly burst out in every direction, throwing down the entire front wall on Penn Avenue, 150 ft. in length. When it destroyed the three adjoining stores on Liberty Avenue is of little consequence, as it had no tendency to go across that street; but when it burst out of the Penn Avenue front a sheet of flame was carried across the street which drove all the firemen out of it, showing that the wind, which all witnesses said was light at first, was from the south and east. The first building to take fire on Penn Avenue was the Horne Department Store, 30 ft. of which lapped the front of the grocery house. The entire front of the Horne store and office building was exposed, but as the other one commenced to burn first, there is a further presumption that the wind was from the southeast. Between these two was an old-fashioned brick dwelling that was wiped out so quickly that no one can tell how long it took to burn. It was practically out of sight



PLATE 13.—Hallway, seventh floor, Methodist Building, showing concrete ceiling and unprotected I beam header warped by heat.

of the spectators. As stated by Chief Humphrey, in less time than it takes to tell it, every front window of the Horne Department Store, whose united surface was 60 per cent. of that of the whole front, vanished from sight, and the goods in the building seemed to take fire simultaneously on every story. The flames swept inward and roared up through the large central light court, which acted as a huge chimney for the whole. It was only the work of a few minutes to envelop in flames all the combustible contents of a building in which there were no partitions. The same results followed only a few seconds later in the Horne Office Building. The percentage of glass on the street front was about the same. In this building on the corner next to the alley was a retail crockery store, next came a retail drug store, and at the west side a store for children's dress goods. Three stories above were occupied as offices for dressmakers, milliners, and doctors. There were tile partitions between the stores and around the stairway, and between the offices on the upper stories, also around the large light hole in the center leading from the second story to the roof. But the whole of the glass in the front was burst in at one time, and the floors fired simultaneously. The contents being less combustible in the upper stories and there being many partitions, the fire did not burn as fiercely as in the department store, but as soon as it reached the light shaft that formed a flue which

drew the fire to the center, the draft even being sufficient to keep it from the stairway, the iron work of which was preserved all the way up. The retarding effect of the partitions and the draft in the light hole kept the fire entirely out of some of the rear rooms above the second story. But in the light shaft it appeared to have been nearly as intense as in the other building.

No water was put on either of these two large buildings until the fire had done most of its work. The fire department was obliged to withdraw and re-form its lines, and by that time everything combustible in the department store had been consumed, even the wooden floors, and only the rear part of the office building was intact. There was little necessity now for water except as a preventive for the plow works in the rear, for the rear brick walls of both buildings and the standard shutters on the department store kept the fire in. The chief fixed the time of actual burning at about two hours, which allowed one hour and ten minutes to reduce everything combustible in the department store to ashes, and for fire to go as far as it went in the office building. The ruins of the grocery continued to burn until 4 A. M., when the whole fire was considered to be under control. But a duration of one hour was too long to enable the unprotected supports of the water tank on top of the department store to keep it in place. This tank was supported by steel beams and not with wood, as has been stated in some publications. But it fell at some time unknown, carrying with it the entire steel construction of girders, columns, and floors of an area of about 50 by 60 ft. of each floor, four passenger elevators, and the grand stairway. But notwithstanding this, the entire steel framework of the east wall, which was covered and filled in with brickwork, was left standing, and only the center of this wall near the top was thrown out of plumb. This is shown on Plate 1, while the interior where the greatest destruction was wrought is shown on Plate 2. The water tank is here seen hanging in the debris from the second story beams. The view is taken from the first story looking across under the light court. This tank was a closed cylinder 7 ft. diameter, and 18 ft. long, and is said to have been full of water. The shock of this fall seems to have acted on the beams of two bays of the floors all the way to the front of building, through the tie-rods, and was so great that it dislodged nearly all the hollow-tile floor arches in these sections. The beams were only saved from fire by the fact that they were left standing free with nothing combustible near them. See Plate 3 for effects of this shock. The same may also be seen on Plate 9, in which it is seen that the fall of the tank carried away the roof and ceiling all the way to the front wall. This must have been caused by the pulling of the riveted roof girders, which broke away from the front column. The iron roof beams and debris falling through may also have contributed to carrying away the floor arches. The sixth story floor beams did not give way except under the tank. It will also be noticed on the same plate that there was some defect in the method of protecting the steel lintels carrying the wall above the sixth story windows, for they all fell carrying the wall with them and leaving the roof over them. This plate also shows the condition in which the front of the office building was left. On this the lintels held and the flat stone finish was left perfect, but the copper cornice was entirely destroyed. The front bricks of both buildings were uninjured, and it is of value to note that they were made of buff fire-clay. The asphalt roofs of both buildings were unharmed except where the roof of the department store fell. Plate 5 shows the con-

dition in which the rear and side walls of the department store were left, on which it will be seen that only the copper cornice was in part destroyed. It also shows that the two roof sections were carried away as far back as the rear wall. It is probable that the tank in falling first struck the roof girder, which being riveted together pulled off at both ends, toppling over all the sixth story columns in that stretch of girder and the rear column built in the wall. This is no argument against riveting, but a strong one against closed tanks at the top of a building.

Shortly after the front wall of the Jenkins Building fell, 75 ft. of the east wall on Cecil Alley, in which the standard shutters were closed, fell with a crash across the alley and upon the roof of the north end of the Traction Company's building,—where shown in double shading on Fig. 1 and Plate 8,—breaking down the I beams and hollow-tile arches, which were made by the Pioneer Fire-proof Construction Company, of Chicago. Otherwise these arches, which had never been plastered, were unharmed. This fall exposed the west wall of the Methodist Episcopal Building to the heat of the burning ruins, which was so intense as to communicate to all the window frames of that building above the second story. (See Plate 6.) From the window frames the fire communicated to nearly all the rooms on the west side, which were more or less damaged by the fuel that they supplied. But the hall stairway and elevator were on the east side of the building, so that the fire department was enabled to fight the fire in this building, using the hall partitions as a shield, and succeeded in keeping most of the fire out of the hall. The fire seemed to catch in each room separately, and it was only on the sixth and seventh floors that it crossed the hall partition sufficiently to work up though the stair well. At the ceiling line of these stories it wrapped around the I beam headers framing the stair openings, which were unprotected by fire-proofing, and both of the beams were bent outward, carrying the cast-iron aprons with them (See Plate 13.) The stairway was not materially injured except at these points. In answer to an inquiry addressed to M. S. Humphrey, Chief of the Fire Department, he said that the fire continued in this building probably one hour. The firemen were in the building two hours all told.

As has been stated, the active fire in all the buildings was included within the two hours from 12 to 2 o'clock. The whole department was on duty until 4 A. M., when the fire was considered to be under control. These dates are important to fix, under the circumstances. No water was thrown on the Horne Department Store, which took fire at 12.40, until nearly everything combustible in it was consumed. The firemen were then able to approach it from the west on 5th Street, and proceeded to "cool it down," to use one of their expressions. Herein I find the cause of many of the hollow tiles on the columns, beams, and arch soffits having been broken. The Chief said that very little water was used, but was free to admit that it might have been better for the building had none been used on it. It was, of course, necessary to deluge the ruins of the Jenkins Building, as in such a one there is always much unconsumed material in the ruins. They were able to approach the office building from Cecil Alley, while it was still burning, and put streams of water into it from the fire-proof Phipps Building across the alley. This building (the Horne Office Building) was also subjected to the cooling off process, but it resulted principally in breaking off the beam tiles, the end-pressure flat arches remaining intact. The power-

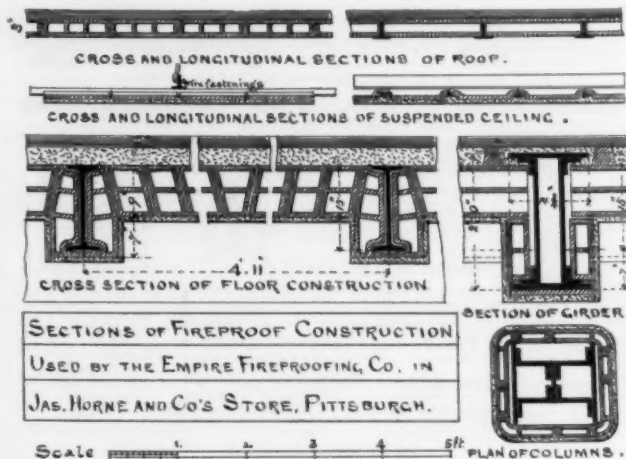


FIG. 2.

ful streams doubtless assisted in breaking down some of the 4 in. tile partitions (see Plate 6), which were all weakened by an industrious carpenter having inserted a flat piece of wood on top of the first course of tiles above the floor in every partition in the building.

THE JAS. L. HORNE & CO. DEPARTMENT STORE.

This building is of steel frame construction throughout. There are four rows of Z bar steel columns standing free, carrying 24 in. built-up girders, the columns averaging 24 ft. 8 ins. from centers. The floor beams average 25 ft. between bearings. They are 15 in. 50 lb. I beams, averaging 4 ft. 11 ins. from centers. The roof was of I beams carrying 1 in. iron and 3 in. book tiles, and the ceiling of light 1 1/2 in. 12 ins. from centers, supporting flat tiles. Fig. 2 shows the steel and hollow-tile construction, the drawing having been made from remains in the building. The exterior steel frame is built into the brick walls. All the hollow tiles were made by the Empire Fire-proofing Company, of Pittsburgh, at their works at Empire, on the west bank of the Ohio River, about eighty miles below Pittsburgh. The work was set by them. The material is pure fire-clay, and hard burned. The walls of all the hollow tiles are generally 1/2 in. thick, and only slightly thicker in the arch blocks. The Z bar columns are covered with 2 in. hollow tiles, with round corners, laid in courses of about 12 ins., eight blocks to a course. They are built as a wall around the columns without other fastening. The floor beams are covered with hollow skew-back tiles on both sides, supporting solid soffit tiles below the beams by dove-tailed bearings. The flat, hollow arches are of the side-pressure model, 9 ins. thick, abutting on the beam tiles. Each tile is divided by a horizontal web in the center into two air spaces. These arches are 5 ins. greater in span than the scale of Fig. 2 shows. There are seven tiles in each arch. The girders are covered on the bottom with solid tiles 15 ins. wide, supported by steel cramps which are exposed and only covered by the plastering. The exposed sides of the girders are covered with 4 in. hollow tiles, extending from the bottom flange of the girder to the under side of the flat arches. Dovetailed wooden sleepers were set on the tile arches, 16 ins. from centers, and filled between with 2 1/2 ins. of ballast, made of cement and cinders. This was covered by a double wooden floor. The tile arches are very light, averaging about 35 lbs. per superficial foot.

Where the fire-proofing was not destroyed by the falling of the tank and the girders, columns, roof, and ceiling which they carried down, the floor arches effectually carried the weight of rubbish remaining on them and protected the steel construction. Notwithstanding that the column covering fell from the whole length of a few columns, and from the upper parts of many others, only one steel column is said to have a slight double curvature, scarcely perceptible. The girders were all effectually protected, and no sag was observable anywhere. The ceiling and roof tiles seemed to stand better than any other part of the work, and there is no sag to either. The ceiling seems to have been a sufficient protection to prevent the exposed bottoms of the 1's supporting the book tiles of the roof from sagging. In the upper stories crockery was melted, as well as cast-iron store stools; yet there is no evidence of fire having penetrated through the floors. This is not to say that the tiles themselves did not sustain considerable damage. The construction of the column covering is something not likely to be repeated. It was not secured to the columns, so that the breaking of one piece or course would let all above it fall. The main cause of the tiles falling was, however,

due to the fact that there was but a very slight break in the joints on the middle of each of their four sides. This can be seen on any of the plates where the fall of plastering has revealed the joints. In many cases the middle vertical joint is almost a straight line. (See Plate 2.) Hence the slightest vertical expansion of the whole length of tiles was calculated to throw them out at the center of each column. The main injury to the floor arches was seen in the falling of the bottom plate. In most places this was only occasional, while in a few it was seen in groups; but in no place that I could find had the middle web given out. Hence the full strength of the arch was preserved everywhere. The greatest injury was to the skew-backs and soffits of the floor beams. The outer shell of the lower exposed section had flaked off in many places, but the inner shell was in most cases intact, so that the soffits fell in only a few places. In no case did enough fall to endanger the beams. The bottom plates of the girders, held up by steel clamps, kept their places with remarkable tenacity, and it was only at rare intervals that any had fallen. The tiles on the sides of girders were generally intact, and only in a few instances had the outer shell flaked off.

It is often said that wooden floors laid over concrete seldom burn, and then only in spots. In this building not only are the double floors completely burned, but the dovetailed sleepers buried in the concrete ballast of cement and cinders are reduced to ashes. And further, the ballast itself is reduced to a soft dust, and does not seem to have any of the consistency of concrete. The only theory to

account for this is that combustion was set up in the unconsumed cinders.

The statement made in the report on the Denver tests that fire-clay tiles do not lose strength or consistency by reheating and throwing on water has been borne out by this experience. The cracking was evidently entirely due to uneven expansion, notwithstanding that the silly explosion theory has already been repeated. The triumph of fire-proofing with fire-clay has been reached in the Horne Department Store, in the simple fact that it has saved the steel skeleton of the first building erected under that system that has

been exposed to a severe fire, and under the most unadvantageous circumstance. The predictions of croakers who claimed that buildings all of steel would be warped out of shape when protected by the modern system of light-weight fire-proofing have not been verified. These buildings looked very bad after the fire, and the photographs from which the plates are made exaggerate the apparent damage. In Plate 7, from a photograph taken on the third story of this building, can be seen its condition where the test was the greatest, showing columns, girders, floor beams, and arches, and the condition in which the floor was found. Plate 4 shows the appearance of the light court and the well-preserved ceiling and roof. The damage on the left was caused by the tank. The architect was the late W. S. Frazer, of Pittsburgh, and it was erected in 1892.

THE HORNE STORE AND OFFICE BUILDING.

This building was designed by the same architect, and erected in 1893. It has four rows of steel Z bar columns carrying double 20 in. steel girders, 16 ft. long. There is no steel in the exterior walls, all of which are brick, and there are three cast-iron columns in the first story store fronts, carrying I beam lintels. There are no lintels in the front wall above the first story except at the top of the third story windows. The front above the first story, therefore, consists of five brick piers, between which were immense wooden window frames with transoms at the third and fourth story floors, all of which have

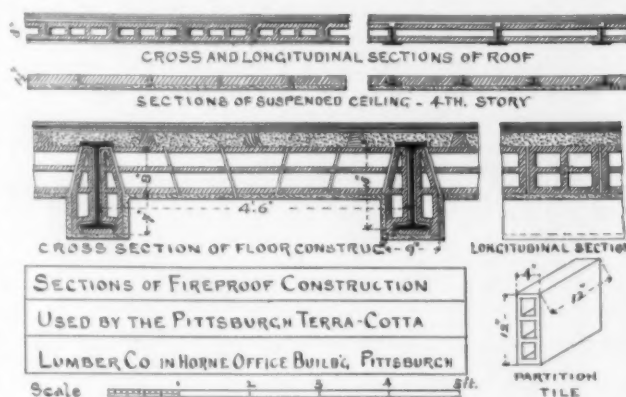


FIG. 3.

disappeared. It would be difficult to invent a front better adapted to invite fire from across the street. The interior construction and roof were, however, entirely of steel and hollow tiles. The floors are of 15 in. 41 lb. I beams, 20 ft. 6 ins. on bearings, and 4 ft. 6 ins. from centers. The roof is of I beams carrying 2 by 2 in. \angle 's, 16 ins. from centers, and the ceilings are carried on $1\frac{1}{2}$ in. suspended \angle 's at 12 in. centers secured to $2\frac{1}{2}$ by 2 $\frac{1}{2}$ in. \angle purlins. The height of the building from sidewalk is 81 ft.

The fire-proofing material throughout is semi-porous red clay hollow tiles, made and set by the Pittsburgh Terra-Cotta Lumber Company. The clay from which they are made is semi-vitreous and contains considerable "grog" or ground brick and tiles. It is not porous terra-cotta in the strict sense, as to be thus called it should be made with an equal bulk of sawdust. Sufficient sawdust has, however, been used to make it burn tough, and to only slightly reduce the weight. The walls of the tiles are about $\frac{3}{4}$ in. thick, though in many places solid $1\frac{1}{2}$ in. tiles are used, as around the columns and in the suspended ceiling over fourth story. The fire test in the building showed that heating, wetting, and cooling did not destroy the structure of the material, as is sometimes the case with very light porous terra-cotta made of plastic fire-clays.

The method of fire-proofing the girders was not evident, as none of them were exposed. The columns all come in partitions, and where exposed are covered with $1\frac{1}{2}$ in. slabs of the above material, not fastened in place other than by mortar, a few of which have been displaced. The illustration (Fig. 3) shows the other methods of fire-proofing used in the building, measured and drawn from the work itself, as no other drawings were attainable. The floor construction is similar in general shape to that of the Horne Department Store, but different in details. It is of end-pressure flat arches, and this is the first actual fire in which they have ever been tested. Each beam is covered with a skew-

back tile on both sides supporting a solid soffit tile between dovetails at the bottom. The floor arches are of end-pressure tiles in five pieces. Each is cut from a rectangle of 8 by 12 ins., with two crossing webs, leaving four holes in each tile. Hence each tile is 8 ins. thick and 12 ins. wide, and the whole arch is 8 ins. thick, 1 in. less than those in the other building, but, I should judge, much heavier. To the honor of this material be it said that I could not find any arch displaced or the bottom of any tile broken off. The floors had the two air spaces available to the end of the fire. The same cannot be said of the skew-back beam coverings, for though they thoroughly protected the beams, the exposed corners of many of them were broken off, and some of the soffit tiles had fallen. This is shown on Plate 6, from a photograph taken from the street looking into the west store next to the stairway entrance. This is the store that sustained the greatest heat. It shows all the excellences and defects of the work in this building. It will be seen that the hall partition has fallen. This was doubtless done by a powerful stream of water, for it is just where one from the east side would strike. The insertion of the unfortunate wooden strip at the bottom of the partitions made them weak against any lateral force. It should be said, too, that this was the only partition of much size that fell. In other places all the partition tiles that were dislodged were around the halls in the upper stories where so much wood-

work was used. None were really destroyed by the action of fire, but through other circumstances, for which the fire-proofer was not responsible; the tiles simply fell down. The floors throughout were built on top of the arches, as in the other building. The ceiling of the fourth story was unharmed by fire. The same can be said of the book tile roof. The asphalt covering of the roof was intact, but the galvanized iron skylight over the light court was completely destroyed, and hardly anything remained to show that it had been there. The steel-truss framework for the skylight was standing, complete, and apparently unharmed. Plate 10, taken from a photograph of one of the front rooms of the fourth story, looking into the hall, shows the worst condition of the partitions in the upper part. The door and hall window of the hall partition have been reduced to one opening, and all the tiles supported by woodwork have fallen. The ceiling is shown intact. In the lower part of the partition on the left can be seen the place where the carpenter had put his usual strip. It has been said that this building was not subjected to as great a heat as the department store, but the whole front of it was exposed to the Jenkins Building. Plate 6 shows a store which was filled with just as combustible goods as the department store, in which nothing remains to be seen but hollow tiles, and in Plate 10 there is evidence of intense heat, and complete destruction of everything combustible. Yet in several of the rear rooms the contents were saved. The value of semi-porous tiles was completely demonstrated in this fire.

THE METHODIST EPISCOPAL BUILDING.

This eight-story and basement building was built with exceptionally heavy walls, and without steel construction except for the floors and roof. The walls on both sides in the first and second stories are 28 ins., in the third and fourth 22 ins., and in the fifth, sixth, and seventh, 18 ins. The eighth story wall on the west side exposed to fire is 18 ins., and on the east side 13 ins.,

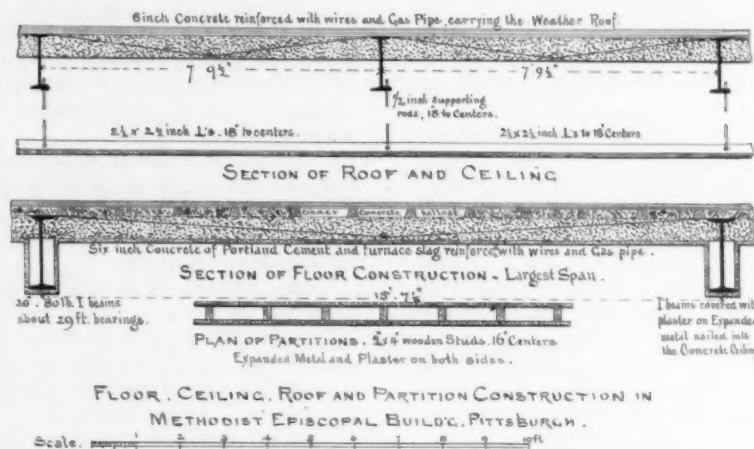


FIG. 4.

with 18 in. piers to carry the I beams of the roof. The floor beams throughout are generally 20 in. 80 lb. steel, 29 ft. on bearings, and the greatest spans between beams are 15 ft. 7 $\frac{1}{2}$ ins. The roof is of 15 in. I beams not more than 8 ft. from centers, to which are suspended by $\frac{1}{2}$ in. rods $2\frac{1}{2}$ by $2\frac{1}{2}$ in. \angle 's 18 ins. from centers, to which is attached expanded metal, plastered. Fig. 4 shows the general construction of floors, ceilings, roof, partitions, and beam covering. Plate 11 shows a room on the eighth story, looking toward the front, with ceiling plastered on expanded metal, and expanded metal and plaster partitions on wooden studs. This room with the two private rooms seen through the doors were the offices of Charles Bickel, the architect of the building. Plate 12 shows the room on the seventh floor immediately under it, with suspended concrete ceiling. Two sections of the concrete ceiling, and also of the floor of this room, sag between the beams from 2 to 3 ins. In other parts of the building which were not burned some of these sections have a permanent sag of about 1 in. Plate 13 shows a view of the hall immediately outside of the last-mentioned room. The center rooms of the sixth story were also damaged about the same as in the seventh. The damage to the fifth story was mainly in the front rooms.

This fire, in such a remarkable location, is not without its lessons to all who are interested in the use of clay materials. These will form the basis of some future suggestions.

Mortar and Concrete.

AMERICAN CEMENT.

BY URIAH CUMMINGS.

CHAPTER VII.—(Concluded.)

CEMENT TESTING.

THERE is no one feature connected with the subject of cements which exerts a stronger influence in the building up of opinions concerning the qualities of a cement than that of color.

The belief is almost universal that a good dark color is a sure indication of a good strong cement.

The tester is an exception who does not express surprise when he finds a light-colored cement testing higher than a dark one; and he almost invariably attributes the cause to some defect in his dark briquettes.

If he should be told that the way it came to be discovered that the world was round, and revolved on its axis, was by observing that people who did much walking in easterly and westerly directions invariably ran the heels of their shoes down at the back, while those who wore theirs off at the sides were found to do most of their walking in northerly and southerly directions, he would feel that his intelligence had been called in question; but it would not occur to him that his own theory in regard to the color of a cement was equally as whimsical.

It is remarkable how strong a hold some absurd prejudices have upon the general public.

It was not so very many years ago that any brand of Western flour, to obtain a market in the Eastern States, had to be put up in round-hooped barrels.

For more than a third of a century it has been repeatedly stated that the color in a cement was due to the presence of a small amount of oxide of iron, and that in no manner did its presence affect the quality of a cement.

General Gillmore so stated it in his treatise on "Limes, Cements, and Mortars," issued thirty-five years ago; and the same statement has been made by various writers during all the subsequent years. Yet the belief prevails that color has to do with the quality.

So strong is this prejudice, that manufacturers of Portland cements, when they find that their available clay does not carry sufficient oxide of iron to give the requisite color to their product, resort to the use of artificial coloring matter, on account of the difficulty experienced in finding a market for light-colored Portland.

Any coloring matter, whether in a natural or an artificial cement, is an adulteration, and is inherent in the Rock cements, while it may or may not be so in the artificial product.

In the Rock cements the oxide of iron is closely associated with the clay, and its quantity, as a rule, governs the shade of coloring given to the cement.

If the amount is small and the calcination is light, the color of the cement will be a pale yellow. But with a higher degree of calcination, the color becomes a deeper yellow, or a light or a dark drab, dependent upon the intensity and duration of the heat.

If the amount is large, the cement will be light to dark brown, according to the intensity and duration of the heat.

Whatever may be the color of a cement, its quality is in no way affected thereby, unless the amount of coloring-matter is excessive.

The quality of a cement is governed by three important requirements, no one of which can safely be dispensed with, namely:—

First, a proper proportion of the essential ingredients, *i. e.*, silica, lime, magnesia, and alumina.

Second, a proper calcination, which must be varied to suit the requirements of varying proportions of the constituent parts.

Third, fine grinding.

It will be seen, then, that a cement may be either light or dark, and yet be of good quality, while a very poor quality of cement may be accompanied by the most taking shade of colors.

And yet, inasmuch as the constituent parts named, when free from impurities, are white, it cannot but be clear that an absolutely pure cement cannot be otherwise than white.

The Rock cements are never colored artificially, and so we find as many variations in color as there are different manufacturing centers, each having its own peculiar shade or tint, while the different brands of the same locality are usually of the same color, yet they may vary considerably in quality.

With the artificial cements, the natural coloring matter is to be found in the clay, the same as with the Rock cements, and, as has been stated, when this is insufficient to suit the prevailing taste (?) resort is had to artificial coloring by the use of some form of carbon, or pigments.

Though the appearance of Portland cement, unadulterated with extraneous coloring matter, is an indication of its merits, it is clear that if artificial coloring matter is employed, the appearance of the cement is no criterion of its quality.

TENSILE TESTS.

The system of arriving at the value of a cement by means of the tensile strain testing machine has grown to such proportions, and is so universally relied upon, believed in, and so seriously regarded as the Ultima Thule of all the knowledge necessary to determine values, and make or unmake a cement in the public opinion, that it seems almost sacrilegious to disturb the serenity of the faithful followers of this modern Juggernaut, who, metaphorically, throw themselves under its sacred wheels.

And yet the system is so permeated with inaccuracies, inconsistencies, and absurdities, that the temptation to puncture the venerable humbug is well-nigh irresistible.

The system contains many features in common with the alleged virtues of the divining rod.

And, although the comparison may seem odious to a large majority of the champions of the tensile test system, yet the author feels measurably assured that a few, at least, of the undoubted facts which he may present will be recognized at sight by many engineers and architects whose experiences with the system have led them into labyrinths of uncertainty and doubt.

The following from a paper on "The Divining Rod," presented by R. W. Raymond at the Boston meeting of the American Institute of Mining Engineers, in February, 1883, is sufficient to illustrate the parallel:—

"First. The immense literature of the divining rod shows nothing more clearly than the boundless confusions and contradictions of its advocates and professors.

"Second. Of the dozen different schools of practise, each is necessarily obliged to reject half of the asserted principles and certified facts put forward by the rest.

"Third. It will be remembered that the Egyptian sorcerers confronted by Moses carried rods, as Moses and Aaron also did.

"Fourth. Cicero, who had himself been an augur, says, in his treatise on divination, that he does not see how two augurs, meeting in the street, could look each other in the face without laughing.

"Fifth. The following formula, cited by Gaetzschmann, may serve as an example:—

"In the name of the Father, and the Son, and of the Holy Ghost, I adjure thee, Augusta Carolina, that thou tell me how many fathoms is it from here to the ore."

One has but to consider that if a package of any brand of cement is divided among fifty expert testers, to be made up into briquettes, all the testers being governed by one set of rules, as to time, temperatures, percentage of water to be used, and the other ordinary requirements, the breakings, when tabulated, will show fifty tables of tests, no two of which will be alike. In fact, they will vary from each other all the way from 1 to 300 per cent., and so, if in the first para-

If it is self-evident that to the system of aiming at moderate or

medium results is due the variations which are often so wide as to be really grotesque, why not abolish such a system and adopt that which will give us without question a full knowledge of the highest limit of strength in the cement, and at the same time reveal to us all its capabilities? And, instead of giving a cement a record based on the average breakings of five briquettes, a most absurd and indefensible system, let the highest testing briquette of the five make the record of the cement.

It is only by the employment of this system that the question of the relative strength of different brands of cement can ever be settled.

It is the only system that is fair to all brands of cement. This is shown by the wonderful uniformity of breakings of briquettes made from any brand of cement where the aim has been to get the highest possible results.

In nearly all the tables of tests that are published where the records of several brands of cement have been carried along for any length of time, it will be observed that one or more of the brands will fall off in a most inexplicable manner.

Perhaps the records are higher at three months than they are at six, or even nine months, and yet at twelve months they may have recovered all the lost ground, or even have made a substantial gain; and so we often notice in long-time tests that a cement may show a strength of, say, 500 lbs. at one year, and 400 lbs. at two years, while the three years' column will show 600 lbs.

This uncomfortable feature is common to the Rock and Portland cements alike.

Should such an uneven showing of one brand be recorded in a table among other brands which show a steady gain, the comparison is naturally unfavorable to the one with the unsteady record.

In fact, it is not at all unusual to meet with those in authority who will unequivocally express a preference for the cement showing the more steady record, even though the brand which has fallen off may have surpassed all the others at the final closing of the table.

The explanation for this curious phase of the subject is found in the deep-seated and profound faith in the infallibility of the testing machine.

If three briquettes are made from a single sample of cement by one person and they are treated alike until broken at six, nine, and twelve months, and the breakings are 500, 400, and 600 lbs. respectively, nothing is more certain than that the briquette which was broken at nine months was not as well made as the others.

If a cement is really weaker at nine months than it is at six months, it is simply impossible for it to show any gain in the twelve months' test.

The absurdity of a cement gaining and losing in strength alternately must be apparent to any person who will study the cause of its setting and hardening.

In the testing of cements by tensile strain the engineer meets with many conditions which seem to puzzle and confuse, among which may be noted that it oftentimes happens in the testing of two or more brands of cement neat, and in sand mixtures, that although the brands may be equal in fineness, the same quality of sand used for all, and all the briquettes made by the same person, yet the cement which tests the highest neat tests the lowest in the sand mixtures.

Rarely more than one set of tests is made, and so the tables are made up, and it is recorded against the highest testing cement that it "tests high in neat tests, but cannot carry sand equal to the lower testing brands."

This is a condition which often confronts the engineer, and, strangely enough, the opinion formed is almost invariably adverse to the brand testing the lowest with sand mixtures, although showing the highest in the neat tests.

In ninety-nine cases in every one hundred the opinion would be corrected by further tests, for it is certain that all conditions being

equal, the cement testing the highest in neat tests will also test highest in sand mixtures, and the failure to do so may be looked for in the imperfect manner of making the briquettes.

The only possible exception to the rule will be found in the fact that a cement containing an excess of clay may test high in neat tests, yet will not carry sand equal to one that is correctly proportioned.

But such cements are so exceedingly rare in this country that the rule may be said to hold good, that the fault is in the making of the briquettes.

There are thousands of masons and contractors throughout the country who buy and use cements, in the construction of cisterns, cellar floors, sidewalks, milldams, foundation walls, and for various other purposes, who have no mechanical means for testing the cements they are using.

To such we suggest the following method.

Although the process is very simple and easy to practise, yet it involves a principle which embraces the chief and most valuable features of all other tests.

In fact, it may be said that there are no known methods for testing the hydraulicity of a cement which for effectiveness and reliability can compare with it.

The author has employed this method, whenever occasion has arisen, during the past thirty years, and he has never known it to fail to detect and expose weaknesses or imperfections, if they exist in the cement.

In the practise of this method it is only necessary to make a mold with which to form bars of cement.

All that is necessary for this purpose is a piece of hardwood plank 3 ins. wide, 2 ins. thick, and 12 ins. long.

Mortise into one side of this bit of wood a cavity $1\frac{1}{2}$ ins. wide, 1 in. deep, and 8 ins. long, making the sides and ends slightly beveled, which, with the bottom, should be made smooth, and then the cavity should be well oiled, after which it is ready for use.

Wet up a sample of the cement to be tested into a stiff paste, and with a trowel press it in firmly, and smooth it off level with the face of the mold.

After the cement has hardened, which will occur in from twenty minutes to two hours, turn the mold bottom up, and let it rest on supports $\frac{1}{2}$ in. thick under each end.

By careful jarring the cement bar will drop out of the mold.

Place the bar on the broad side in a pan or box, with the ends resting on supports in such manner that at least 6 ins. of the length of the bar shall be free and clear underneath, with a vertical clearance of 1 to 2 ins.

Next, fill the receptacle with water until the cement bar is completely submerged.

If the cement is strong in hydraulicity, the bar will maintain its shape indefinitely; but if it is lacking in this quality, or is weak, or defective in its composition or manufacture, it is sure to give way between the supports.

The author has known of rare cases where the bar maintained its shape ten days and then collapsed, but the ordinary defects in a cement will be made manifest within twenty-four hours.

Bars made with sand mixtures, of course, require a longer time to harden than those made from neat cements, and, therefore, should be given a full opportunity to crystallize before submersion.

In closing our chapter on the testing of cements, the thought arises, which, although somewhat tinged with impertinence, will not be dismissed without expression.

In our first chapter we quoted from "Hydraulic Mortars," by Dr. Michaelis, Leipzig, 1869, as follows: "The Eddystone Lighthouse is the foundation upon which our knowledge of hydraulic mortars has been erected, and it is the chief pillar of our architecture."

This sentence covers a great deal of ground, and is worthy of much thought and consideration; and granting that it is true, we are lost in conjecture as to what John Smeaton would have done when he built the Eddystone Lighthouse, had the cement which he used in

the construction of that famous tower been passed upon by a British government engineer, with a tensile strain testing machine as his guide, and governed by the absurd rules and specifications, for this cement could not possibly have tested 25 lbs. per square inch in a seven-day neat test.

What would be thought of the manufacturer of to-day who would have the temerity to offer such a quality of cement for the construction of a lighthouse in this country or in Europe?

Everybody knows he would be ridiculed, for it is a question if Rock cement testing 150 lbs. in seven days would be considered strong enough, and it is more than likely that a Portland testing 400 lbs. in a seven-day neat test would be required.

Yet the Eddystone Lighthouse stood in good condition over one hundred and twenty years, until taken down to make way for a larger structure; and the mortar was found all that could be desired.

This being true, what becomes of our boasted advance in the art of cement making?

Where can we find a more trying place for a cement mortar than in the stone walls of a lighthouse standing out in the open sea?

Wherein lies the benefit of using a high-testing cement for such work, when a cement of the quality of the Aberthaw hydraulic lime used by Smeaton in the walls of the Eddystone Lighthouse can be supplied in this country for less than one fourth the cost of the high-testing cement?

If we care to build for all time, we must remember that that which causes a cement to set promptly in water also causes its comparatively early disintegration when exposed to the atmosphere.

A cement, therefore, which requires sixty or ninety days to harden in exposed masonry will be found in perfect condition ages after the mortar made from quick-setting cements has crumbled out and disappeared.

The investigations of Professor Tetmajer, of the Federal Polytechnical School, at Zurich, developed the fact that some German Portland cements, when used in work exposed for several years to the air, lose their consistency and crumble.

So serious had this danger become that, only a few years ago, the German Minister of Public Works issued a circular restricting within narrow limits the use of Portland cement in work exposed to the air.

Professor Tetmajer found, after careful examination, that the cause of the disintegration of Portland cement exposed to the air is found in a want of proper preparation of the materials, particularly in the lack of sufficient grinding together of the chalk and clay to insure the complete silification of the lime during the process of calcination.

He also found that the best brands of German Portland cement which had withstood the action of water for several years became soft on exposure to air.

He says, also, that "air especially attacks sharply (hard) burnt cements, which imbibe a great deal of carbonic acid, and the decay in water is caused by an excess of matters which undergo an increase in volume by oxidation and imbibing of water."

What, then, can justly be claimed as an advance in the art of cement fabrication since the days of Smeaton, one hundred and forty years ago?

We have managed how to make a cement which will set hard in much less time now than then, but at the expense of endurance and this is, practically, all that has been learned.

The cement world of to-day is wrought to a high pitch in the matter of high short-time tests. The pendulum has swung in that direction without let or hindrance. But it will start on its return as soon as sufficient time has elapsed to prove beyond question that a cement may test too high, that all tests above the medium are developed at the expense of endurance.

And so there are those living to-day who will witness the passing of the high-test craze, and who will smile when they read of the conditions surrounding the testing of cements during the latter half of the nineteenth century.

The Masons' Department.

STRAINS IN ARCHES. I.

BY JOSEPH MARSHALL.

IN order to sustain any load over a void, between two supports, we have only four means available: (a) the lintel; (b) the arch; (c) the suspension cord or arc; and (d) the cantilever. In the lintel we have two forces in the same body — compression and tension. The relative areas of the body composing the lintel which are subject to these opposite forces at any one time, or in any one instance, must depend upon the nature of the material of which the lintel is composed and upon the force of the load borne. As a result we have what we call the *transverse strain*, which is only the offspring of the two opposing forces of compression and tension, both in operation at the same time in different parts of the same mass. It follows, therefore, that the highest efficiency is obtained from a lintel when the molecules of the matter of which it is composed possess a high degree of cohesion among themselves, and a high degree of resistance to compression. From these two qualities result *rigidity*. The lintel then derives its usefulness from this quality of rigidity.

The arch, on the contrary, has all its parts in a state of compression, and, therefore, only one kind of strain in operation in the masses of which it is composed. But because it is composed of several masses whose relations of cohesion to each other depend mainly on the gravity of their individual masses, there necessarily exists in the arch, as a construction, a high degree of pliability. So that while the lintel is wholly in transverse strain the arch is wholly in compression. But accompanying the arch and inseparable from it, as a construction, is this dangerous quality of pliability. While the office of the arch and lintel are the same, the manners of discharging the functions are different — their physical properties, and the effects produced upon their respective supports, are different. The lintel discharges all the force of the load borne, vertically upon its supports, and exercises no disturbing influence in a lateral direction. The arch conveys the whole force of the load borne to its supports, but at the same time exerts a lateral pressure tending to disturb their verticality, although not always in the same direction, yet, as generally used, tending to drive them apart.

It is of no importance, in considering their relative properties, whether an arch be perfectly horizontal, or a lintel be of any degree of curvature which an arch might exhibit, the physical properties of each remain quite unchanged. It is quite conceivable that a lintel might be made of a semicircular or other curved form to span a void and rest on two distant supports, yet while it may look like an arch and fulfil the office of an arch, it would still be nothing more than a curved lintel. On the other hand, an arch could be built so as to present horizontal boundary lines at top and bottom (as lintels usually do), but if it were composed of more than two distinct pieces which, by their collective relations and gravity, retain their position in place, *it is an arch*, although it may *seem* to be a lintel.

An arch, then, is definable as: An assemblage of not less than three pieces of any firm material so arranged in position that by their contact with each other, and their inherent gravity, they retain their relations of place and position so as to form a continuous structural way impeding a sub-transverse void, and having support at its extremities only.

It is not necessary that such a structure should present to view in any part or particular a curvilinear form — such characteristic being incidental to convenience only.

In order to the better understanding of what we may say later, we will here divide arches into their natural classification.

All arches, of whatever form, are comprehended in two classes.

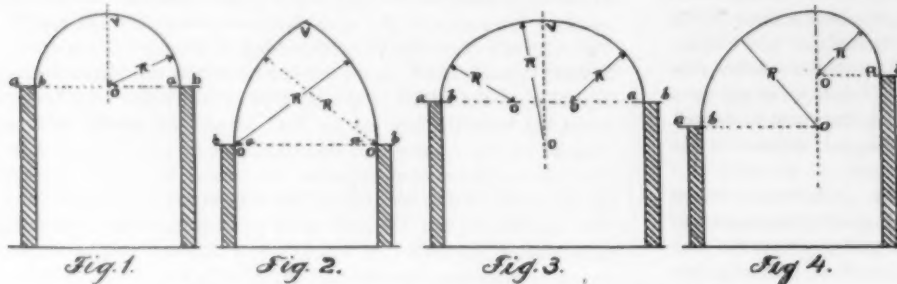
In three articles which will be published in consecutive numbers of THE BRICKBUILDER, Mr. Marshall, who has made an exhaustive study of the subject will give briefly his theory regarding the "Thrusts and Strains in Arches." — Eds.]

First, all arches springing from horizontal planes. Second, all arches springing from inclined planes.

In each of these classes there are four distinct varieties:—

FIRST CLASS. *a.* Arches springing from horizontal planes the arcs of which are described from one center, and which attain their apex or maximum altitude (the highest point of the intrados) at a point vertically over the center of the arc. See Fig. 1.

b. Arches springing from horizontal planes, the arcs of which are described from two or more centers, and which attain their apex



a b horizontal planes; *c* centers of arcs; *r* radius; *v* apex or highest point of intrados.

at a point to be determined by the intersection of their arcs. See Fig. 2.

c. Arches springing from horizontal planes, the arcs of which are described from three or more centers, only two of which are located on the horizontal line from which the arches spring, and which attain their apex vertically over the center of the span. See Fig. 3.

d. Arches, springing from horizontal planes, the arcs of which are described from two centers in the same vertical line, and which attain their apex at a point in the same vertical line in which their centers occur. See Fig. 4.

SECOND CLASS. *a.* Arches, the arcs of which are described from one center, springing from inclined planes, situated below the point where a line drawn at an angle of 45 degs. of elevation from the center of the arc would intersect that arc, and which attain their apex at a point vertically above the center of the arc. See Fig. 5.

b. Arches, the arcs of which are described from one center, springing from inclined planes, situated at or above the point where a line drawn at an angle of 45 degs. of elevation from the center of the arc would intersect the inner line of the supporting pier, and which attain their apex at a point vertically over the center of the arc. See Fig. 6.

c. Arches, the arcs of which are described from two or more centers, and which spring from inclined planes, situated below the point where a line, drawn at an angle of 45 degs. from the centers of the arcs, would cut the arc, from whose center it is drawn, and which attain their apex at the point where the arcs intersect. See Fig. 7.

d. Arches, the arcs of which are described from two or more centers, and which spring from inclined planes, situated above the point where lines, drawn at an angle of 45 degs. of elevation from the centers of the arcs, would intersect the inner lines of the supporting piers, and which attain their apex at the point where their arcs intersect. See Fig. 8.

Each class and variety has inherent elements of action peculiar to itself, but all are comprehended under one unchanging law.

It has been usual, we believe, to consider that all arches begin to exercise their thrust force at the *springing line*, and we believe most commentators on the arch take this for granted, and begin by assuming this premise to be correct. But from our investigations we are led to believe that this assumption is erroneous as a general law, but

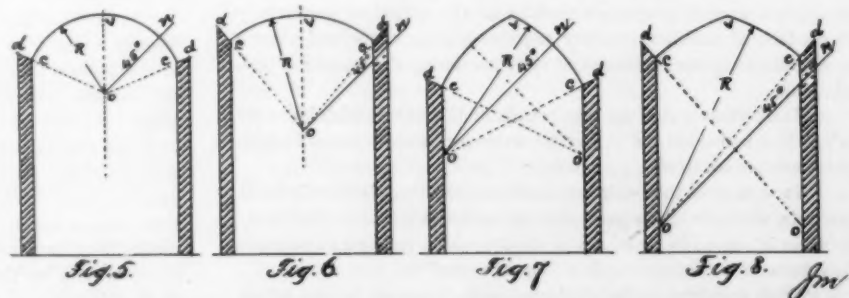
quite correct under certain circumstances. Hence, it is at best but misleading. Some forms of arches, although bound together at the springing line by sufficient force to prevent spreading of the supports *below* the spring line, could, nevertheless, be quite completely overthrown *above* the spring line by placing sufficient load at or about the crown. It is true that the force required to accomplish this result would be much greater than if the same arch was mounted on piers of greater or less height, and the reasons, therefore, we shall endeavor to present in future chapters.

In all our means of spanning voids, considering each contrivance as a whole, there seems to be no real difference in the manner of applying forces to resist gravity—tension and compression being the two forms of its application to matter. Indeed, it is exceedingly doubtful if force can be otherwise applied to matter.

We have observed that in the lintel one part was in compression while the other was in tension. This is equally true of an arched structure, *i. e.*, the arch and its piers, though not true of the arch itself. All parts of the *arch* are in compression, but the resistance of the piers is the equivalent of tension; indeed, it is the *evidence* of tension. A truss, no matter how elaborate, is only a constructed lintel, which has, like the monolithic lintel, its tension and compression within itself, differing from the arch, which has its compression within itself and its tension in its piers. The suspension cord is the reverse of an arch, being all in tension, but demanding the complement of compression from its supports. A cantilever is an arrangement of three trusses, or lintels (supplemented with gravity counterpoise), so arranged that two of them have their tension parts uppermost, and in opposite position from the third.

FROM THE BENCH.

LIABILITY OF ASSIGNEE OF BUILDING CONTRACT.—Where an assignment of a building contract as collateral security for a loan required the assignee to pay all moneys received on the contract to the assignee, and the assignee to apply them to the payment of claims



d c inclined planes; *e* centers of arcs; *r* radius of arcs; *v* apex or highest point of intrados; *e n* the line drawn at an angle of 45 degs. elevation from the center of the arc to intersect the arc or the inner line of supporting pier, as may be.

arising under the contract, the assignee was not liable for the payment of such claims beyond the amounts so received.—*Supreme Court, Penn.*

CONTRACTOR MAY HAVE FRAUDULENT CONVEYANCE SET ASIDE.—A contractor having a mechanic's lien may sue to set aside as fraudulent a conveyance of the premises by the owner. His standing, said the court, is not that merely of a general creditor, who must first obtain a lien on the property of the debtor by the recovery of a judgment and issue of execution. His lien is perfect on complying with the requirement of the statute, and it is a specific lien on the particular property, similar in all respects to a mortgage.—*Supreme Court, N. Y.*

Recent Brick and Terra-Cotta Work in American Cities, and Manufacturers' Department.

NEW YORK.—The most interesting event during the past month was the signing of the Greater New York charter by Governor Black.

A few facts regarding the extent of Greater New York may be of interest to our readers. The new city will cover 359.75 square miles. Its population will be 3,200,000. Length, 35 miles. Width, 19 miles at widest point.

There will be 167,000 buildings, of which 130,000 are residences.

During the past month the prospectus of the preliminary com-



ST. JAMES BUILDING, 26TH STREET AND BROADWAY, NEW YORK CITY.

Bruce Price, Architect.

The four hundred thousand red face brick used in the four exterior walls of this building were made by the Fuller Brick and Slate Company, Pine Grove Furnace, Pa., and supplied through their New York representatives, H. F. Mayland & Co.

petition for the New York Public Library has been published. As announced recently in THE BRICKBUILDER, this building is to be a large and important one, and will be the home of the Astor, Lenox, and Tilden Libraries. \$2,500,000 has been appropriated. Unfortunately the conditions of the competition are so unsatisfactory that very few of the leading architects will compete. Just now the New York architects are making a bold stand to have competitions properly conducted. It is a noble and worthy effort, and cannot be too highly commended.

Barnard College has been presented with \$140,000 by Mrs. Joseph M. Fiske, to be devoted to a dormitory building.

The designing of the new Hall of Records has been entrusted to J. R. Thomas, who received first prize in the late City Hall competition.

Preparations for the new Chamber of Commerce are being made



CAP TO COLUMN, ENTRANCE BOHEMIAN CLUB, NEW YORK CITY.
Made by Excelsior Terra-Cotta Company.

rapidly. \$300,000 has been subscribed towards the building fund. The building will cost about \$1,000,000.

Plans have been filed for an addition to the American Museum of Natural History, to cost \$500,000. Cady, Berg & See are the architects.

Little & Brown, of Boston, have planned a \$100,000 house for Mr. E. W. Bliss, to be built on 61st Street, East.

F. A. Minuth has plans for the new \$80,000 church for St. Paul's Lutheran Association, 22d Street and Eighth Avenue.

Plans have been filed for seven four-story and basement brick and stone dwellings on Riverside drive and 80th Street. Cost, \$180,000. Clarence True, architect.

William R. Grace has purchased four lots on the north side of 60th Street near Amsterdam Avenue, as a site for the Grace Institute, for the instruction of young women, in practical arts and business.

Renwick, Aspinwall & Owen have prepared plans for a \$100,000 country residence for Mr. Frederick Potter, at Sing Sing on the Hudson. It will be 60 by 150 ft., built of brick and terra-cotta.

Plans have been filed for a fifteen-story office building, 9 to 13 Maiden Lane, for Mr. Frank Gill. R. S. Townsend, architect.

C. P. H. Gilbert has planned a \$200,000 hotel for R. N. Rafalsky, on 45th Street near Sixth Avenue, to be used as bachelor apartments.

Babb, Cook & Willard have planned a printing office for the New York Life Insurance Company, to be built corner of Elm and Leonard Streets. Cost, \$150,000.

An addition to St. Vincent's Hospital, West 11th Street, near



CAP TO PILASTER, FOURTEENTH STORY, ST. JAMES BUILDING,
NEW YORK CITY.
Bruce Price, Architect.
Made by Perth-Amboy Terra-Cotta Company.



TERRA-COTTA ARCH, FIFTEENTH STORY, ST. JAMES BUILDING,
NEW YORK CITY.
Bruce Price, Architect.
Made by the Perth Amboy Terra-Cotta Company.

Greenwich Avenue, will be built at a cost of \$300,000. Schickel & Ditmars, architects.

Mr. J. T. Tower has bought the property 50 by 100 ft. corner of Fifth Avenue and 45th Street, for \$410,000. He intends to erect a ten-story office and studio building.

The Metropolitan Street Railway Company intend to erect a car and power house at 146th Street and Lenox Avenue, at a cost of \$200,000. A. V. Porter, architect.

PHILADELPHIA.—There seems to be a steady improvement in the building trades, and we are told that there have been more projects figured upon within the last three months than in any similar time since the depression reached this city.

Prominent amongst the projects now being put forth we may mention the Parkside Apartment House, which will be built on the corner of Parkside Avenue, 40th Street and Girard Avenue, a location unexcelled for a building of its kind. It will be of light bricks, stone, and terra cotta, seven and a half stories high, and the three fronts will be 90 ft., 29 ft., and 75 ft. respectively. The style will be French Renaissance, the lobby and main entrance in the style of Louis XVI., and the reception room Moorish; there will be a restaurant on the top floor, and a roof garden above. Architect Angus S. Wade has the work in charge.

Architects D. H. Burnham & Co., of Chicago, Ill., have completed the drawings for the \$2,000,000 office building which the Land Title & Trust Company, of this city expect to erect at the corner of Broad and Chestnut Streets. The site has been cleared of the buildings which formerly occupied it, and estimates upon the work are being made. The building will be 75 by 100 ft., fifteen stories high, the first and second of granite, and the others of buff brick and terra-cotta. It is intended to be the best equipped and most thoroughly modern office building in the city.

An apartment house will also be erected at 16th and Spruce Streets, by Mr. A. H. Mershon, from plans made by architect Thomas Bennett. This will also be thoroughly up to date, and of brick and terra-cotta.

There will be an addition built to the infirmary at Girard College. It will be three stories and basement, and conform to the present

building. It will be 75 by 154 ft., and contain mortuary room, disinfecting room, swimming pool, and large wards.

The first award of the John Stewardson memorial scholarship in architecture was made on Monday last to H. L. Duhring, Jr., a graduate of the School of Architecture of the University of Pennsylvania. The problem was a city church in the style of the Renaissance. Mr. Duhring's design was adjudged as of especial merit. Charles Z. Klauder and Oscar M. Hokanson were awarded equal honorable mentions. The first prize gives to Mr. Duhring the use of \$1,000 to be expended in travel and study in Europe, under the direction of the trustees of the fund. The judges were Prof. Wm. R. Ware, of Columbia College, G. L. Heins, and John Galen Howard, all prominent architects of New York.

BUFFALO.—Activity in the architectural and building lines in general is becoming now a little more pronounced. One noticeable feature is that few good buildings of the residence class are in progress, but chiefly flats and tenement buildings of low cost, which tends to prove that business has not improved to the extent anticipated.

Amongst the more prominent buildings nearing completion may be mentioned the eight-story apartment house, "The Lenox," on North Street near Delaware Avenue. Lovering & Whalen, architects.

The entire cost of the building was about \$400,000.

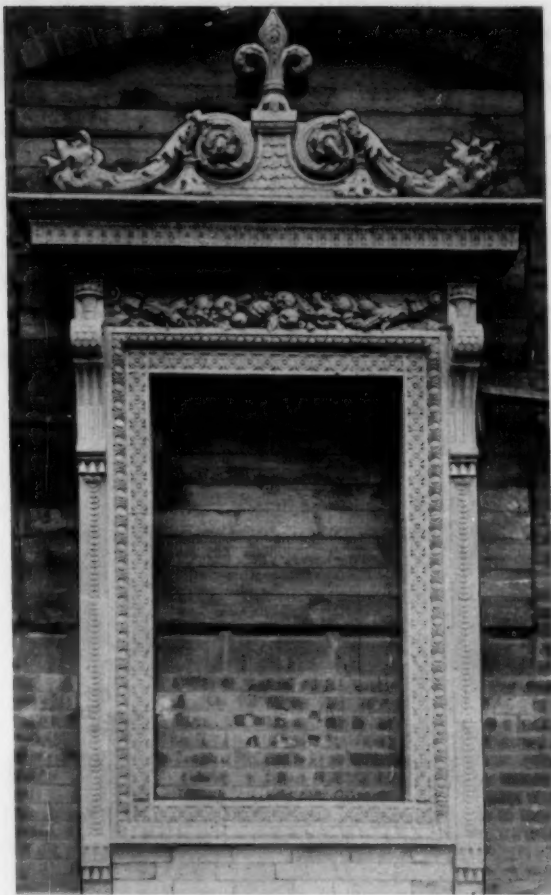
The John Otto & Son's five-story, fire-proof store and office building on Main Street. This building, with a frontage of 110 ft., has a first story of granite, and the entire superstructure of light buff terra-cotta, manufactured by the Northwestern Terra-Cotta Company, of Chicago; the four-story business block on Main Street, near Huron Street, erected by the Evans Estate; this building is of steel construction, fire-proof, and has a very ornate front composed entirely of white terra-cotta, supplied by the above-named firm. E. A. Kent is the architect for both these buildings.

Amongst projected buildings may be mentioned the \$50,000 "Welcome Hall," to be erected on Seneca Street by the First Presbyterian Church, and to be used as a place of recreation and reformation of the lower classes of all creeds. Green & Wicks are the architects.

The same firm is preparing drawings for the new ten-story, fire-proof office building to be erected by the trustees of Syracuse University, at Syracuse, at an expenditure of \$451,000; also the new brick residence and stable,



TERRA-COTTA DETAIL, OFFICE BUILDING,
FIFTH AVENUE, NEW YORK.
Albert Wagner, Architect.
Made by White Brick and Terra-Cotta Company.



THIRD STORY WINDOW, VAN RENSSELAER HOUSES, ALBANY, N. Y.
 Marcus T. Reynolds, Architect.
 Made by New York Architectural Terra-Cotta Company.

designed in a most severe style of Elizabethan architecture, at the corner of Delaware Avenue and Ferry Street, for John Glenny.

The Historical Society has finally decided to erect their new building in the Delaware Park, near the lake, at an outlay of \$50,000, but as yet no architect has been selected; in fact, it has not been decided whether or not it will be put up to open competition.

The erection of an enormous convention hall by this city has been authorized by both houses, and the sum of \$400,000 appropriated, but no site has yet been selected, although the idea of using the present Chippewa Market site, and having the hall built over the market, is meeting with much favor. When the ideas of the public are finally crystallized, competitive designs are to be asked for.

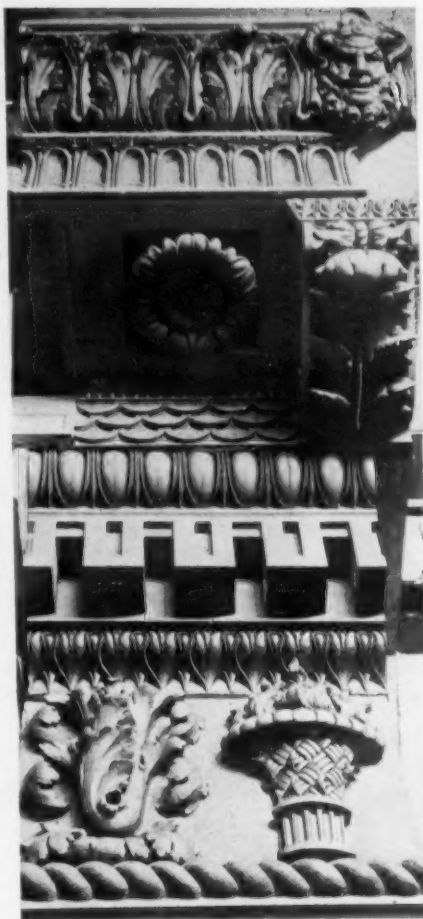
The contract for the new shops of the Merchants' Dispatch Company at Penfield, N. Y., has been let to J. L. Stewart & Co., for \$118,215.

The new East Side High

School, also four new public schools, are almost ready for use, and are to be formally opened after the summer recess. Two of the schools have been built of fire-proof construction, and since it has been found that the cost did not exceed that of the non-fire-proof ones, the intention is that all new buildings used for school purposes shall be built as nearly fire-proof as possible.

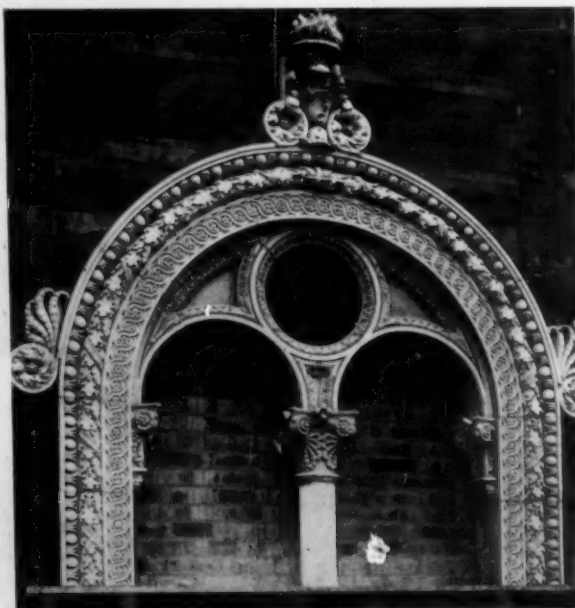
PITTSBURG.

Building projects are on the increase, and several very good buildings are under way, among them being the new Horne Store Building, to be erected on the site of the burnt building, from plans by architects Peabody & Stearns, to be steel and fire-proof construction. The Horne Office



MAIN CORNICE, VAN RENSSELAER HOUSES, ALBANY, N. Y.

Marcus T. Reynolds, Architect.
 Made by the New York Architectural Terra-Cotta Company.

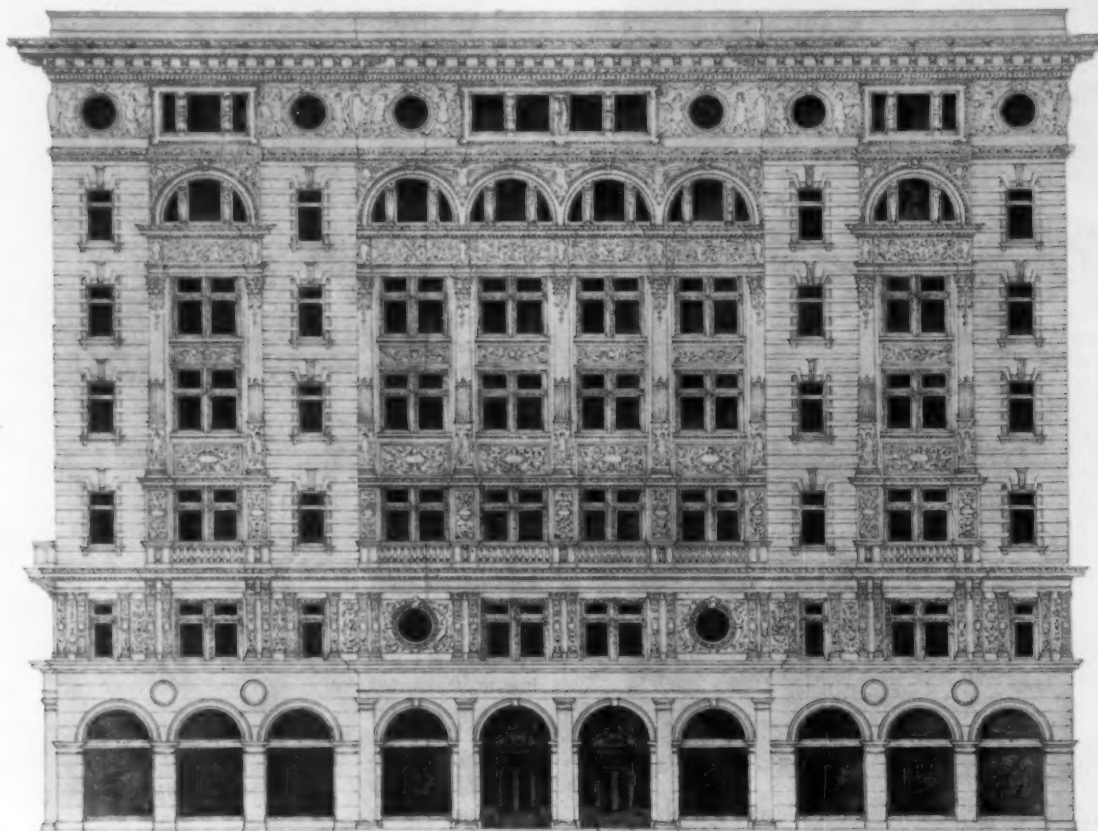


SECOND STORY WINDOW, VAN RENSSELAER HOUSES, ALBANY, N. Y.
 Marcus T. Reynolds, Architect.
 Made by the New York Architectural Terra-Cotta Company.

Building, which was also destroyed by the fire, will be rebuilt from plans by architects Struthers & Hannah, successors of the late W. S. Fraser. The same firm are also preparing plans for a five-story building for Mrs. McCullough, to be erected opposite this building, but facing on Liberty Street, to be of brick and terra-cotta. The Jenkins Building, in which the fire originated, will be rebuilt from plans prepared by architects Topp & Craig. It is to be six stories, and of steel construction, to cost \$150,000. The same firm are preparing plans for a brick hotel, to be erected at Ebensburg, Penn., for G. B. Denny, Esq. Architects Alden & Harlow are preparing plans for the West End branch of the Carnegie Library. Architects Geo. Orth & Bros. are preparing plans for a large brick warehouse for Harry Darlington, to be erected on Seventh Avenue. The B. P. O. E. of Allegheny

are contemplating the erection of a club house, to cost \$25,000. Architect S. T. McClarren has prepared plans for a sixteen-room schoolhouse for the sixteenth ward, to cost about \$75,000. Architect J. E. Campbell has prepared plans for a six-story hotel building at

The "Colonial," which is designed for bachelor apartments, has just been completed. Messrs. Barnett, Haynes & Barnett were the architects. The building occupies the site of the old J. E. Kaime residence, and into which the old residence has been incorporated.



PROPOSED BUILDING FOR THE CURTIS PUBLISHING COMPANY, SIXTH AND WALNUT STREETS, PHILADELPHIA, PA.
MacCollin & Fast, Architects.

Greensburg, Penn., for Jno. Keck, Esq., to cost \$40,000. City architect H. S. Bair is preparing plans for No. 27 Engine House, to be two stories, brick and stone.

ST. LOUIS.—There is less work in the architects' offices at the present time than at any previous time within a number of years, not excepting during the panic of 1893. The report of the Commissioner of Buildings shows permits taken out for improvements aggregate more than for the corresponding time last year, but it consists mostly of alteration and small residences or cheap flats, which are innocent of ever having been in an architect's office.

Architect August Brinke has prepared plans for an apartment building 150 by 215 ft., to cost \$125,000, and for a bakery to be located on Grand Avenue, to cost \$200,000, for the Weile, Boettlers Bakery Company.

Architect H. E. Roach has prepared plans for an apartment building for Mr. E. B. Woolfe, to cost \$500,000.

DETROIT.—Architect Gustav A. Mueller has completed plans and let the contracts for the erection of a handsome five-story store for Ernst Kern, retail dry goods dealer, to be erected at the southeast corner of Woodward and Gratiot Avenues. It will have a frontage of 36 ft. 8 ins. on the former avenue, and 100 ft. on the latter. The exterior will be of buff pressed brick, with trimmings of Ohio buff sandstone and terra-cotta. It will cost \$35,000.

Architects Malcomson & Higginbotham are preparing plans for a \$30,000 residence for Edward Ford, Wyandotte, Mich., to be of pressed brick, terra-cotta, and buff sandstone. Also completed plans for additions to two public school buildings for the Board of Education, Detroit, to be of brick, and cost respectively \$20,000 and \$10,000. Also completed plans for a two-story pressed brick residence for Dr. Reuben H.

Osborne, to be built on Ledyard Street, to cost \$10,000.

Architects Spier & Rohns have prepared plans for a two and a half story pressed brick and stone residence for C. W. Althouse, to



TERRA-COTTA DETAIL, HORTICULTURAL HALL, PHILADELPHIA.
Frank Miles Day & Brother, Architects.
Made by the Conkling-Armstrong Terra-Cotta Company.

be built at the northwest corner of Woodward and Delaware Avenues. It will have tile roof, and cost \$20,000. Also prepared plans for a two-story pressed brick parochial residence for the Roman Catholic parish of the Sacred Heart of St. Mary, to cost \$10,000.

Architects John Scott & Co. have completed plans and awarded contracts for a three-story double residence for Jeremiah Dwyer, to be built at the northwest corner of Jefferson and St. Aubin Avenues. It will be of buff pressed brick trimmed with terra-cotta and buff sandstone, and cost \$17,000.

Architect Edward C. Van Leyen has prepared plans for a two and a half story pressed brick residence for Charles L. Coffin, to be built on Medbury Avenue. It will have tile roof, and cost \$10,000.

Architects Mortimer L. Smith & Son have completed plans for a \$10,000 pressed brick double residence for Mrs. O. N. Brown, to be built on Warren Avenue.

Architects Baxter & Hill have plans for a two and a half story

Bayley & Goodrich. Mr. Putnam will continue the business of the old firm.

THE CHICAGO ARCHITECTURAL CLUB held its last "Bohemian night" meeting before vacation, on Monday evening, June 7, in the club rooms. H. Y. von Holst, Adolph F. Bernhard, Chas. Eliot Birge were hosts. The club rooms will be open during vacation.

THE regular monthly meeting of the St. Louis Architectural Club was held on Saturday evening, June 5. It was decided to discontinue the classes during the summer months excepting the water-color class, under the instructions of F. C. Dwyer.

The club's exhibition, which is purely local, consisting solely of the work of members of the club, opened on the same evening.

The monthly meetings, which are largely of a social character, will be in the way of excursions, etc., until the fall work commences. The first of these excursions will be to Belleville, Ill., to inspect the brickyards at that place.

ITEMS OF INTEREST AND VALUE.

THE city of Worcester has contracted for Atlas brand American Portland cement for this season's supply.

POWHATAN cream-white bricks will be used in the new Troy Bazaar Building, at Troy, N. Y.

WALDO BROTHERS have secured the cement contract for the city of Quincy, Mass., for this year, supplying them Hoffman, Rosendale, and Atlas brand of American Portland.

H. F. MAYLAND & Co. are the New York representatives of The Burlington Architectural Terra-Cotta Company, of Burlington, N. J.

THE town of Melrose, Mass., has contracted with Waldo Brothers for their season's supply of cement, the brands being Hoffman, Rosendale, and Brooks, Shoobridge & Co. Portland.

THE cement for the Southern Union Station has been awarded to Waldo Brothers by Norcross Brothers, Hoffman being the brand. This is the largest order for cement ever placed in Boston.

H. F. MAYLAND & Co., United Charities Building, are the New York representatives for Messrs. Oliphant & Pope, manufacturers of white and mottled front brick from plastic clay.

THE Powhatan cream bricks which are being used for the front walls of the new Art Museum, Worcester, Mass., are supplied by Waldo Brothers.

THE town of Milton, Mass., has contracted with Waldo Brothers for the furnishing of Brooks, Shoobridge & Co. Portland and Hoffman Rosendale cement for this year.

THE contract for Portland cement to be used by the town of Wellesley, Mass., has been awarded to Brooks, Shoobridge & Co., Waldo Brothers being agents.

THE AMERICAN ENAMELED BRICK AND TILE COMPANY have just closed a good-sized order with Messrs. Norcross Brothers for enameled brick for private stable of Mr. William K. Vanderbilt, at Hyde Park, N. Y.

THE PHILADELPHIA AND BOSTON FACE BRICK COMPANY have closed the following contracts: buff molded and arch brick for B. & M. Railroad Company station at Northampton, Mass.; gray molded brick for Pierce Building on Vernon Street, Boston; buff face and molded brick for Mayo Building, at Erie, Penn.

CHARLES T. HARRIS, Lessee, Celadon Terra-Cotta Company, will supply the roofing tiles for the following buildings: Mortuary



TERRA-COTTA DETAIL, BRAZIER BUILDING, BOSTON.

Cass Gilbert, Architect.
Made by the Northwestern Terra-Cotta Company.

stone and pressed brick residence for Edwin Earle, to be built on the east side of Woodward Avenue, to cost \$10,000.

Architect Albert E. French has prepared plans for a two and a half story pressed brick residence with cut stone trimmings for Justice H. L. Shellenburg, to be built on Forest Avenue, at a cost of \$10,000.

PERSONAL AND CLUB NEWS.

MR. L. D. BAYLEY has retired from the firm of Putnam & Bayley, architects, Northampton, Mass., and has formed a copartnership with Mr. Goodrich, of Hartford, Conn., under the firm name of

Chapel, Wildwood Cemetery, Williamsport, Penn., D. K. Dean, architect; station for Erie Railroad, at Jamestown, N. Y., G. E. Archer, architect; station for the Erie Railroad, at Paterson, N. J., G. E. Archer, architect; residence for C. W. Hoff, Chicago.

FISKE, HOMES & Co. have just completed two large orders for brick at Providence,—the State Normal School, Martin & Hall, architects, and the new railroad station, Stone, Carpenter & Wilson, architects; the former a light buff, and the latter a fire-flashed mottled brick. They are now supplying the Falston brick for the new Masonic Temple at Pawtucket. W. R. Walker & Son, architects.

AN interesting piece of work is now being done for the new bath house at Revere Beach, Mass., by W. T. Eaton, in connection with the Murdock Parlor Grate Company. It consists of a sea wall and a considerable quantity of artificial stone work, both being made of Alsen German Portland cement and furnished by Waldo Brothers. We predict a large amount of this work will be done in the near future with Portland cement.

MEEKER, CARTER, BOORAEM & Co., New York City, have taken the agency of the Eastern Paving Brick Company, of Catskill, N. Y., and have in charge the paving of the streets of Patchogue, L. I. Mr. Paul O'Brien will have charge of this department. This company under its new management is making a high-class vitrified shale paving brick at the rate of 100,000 per day, and their water facilities and nearness to the Metropolitan district gives them a decided advantage in that market.

H. H. MEIERS & Co.'s Puzzolan German Portland cement has been specified by Winslow & Wetherell, architects, for the White Building, on Boylston Street, the Converse Building, on Milk Street, and also for the office building on the corner of Kilby and Doane

Streets, Boston. The cement is called for on account of its non-staining qualities as well as its high tensile strength, and all the brickwork in connection with the front will be laid with this cement. Waldo Brothers, Boston agents, will furnish it.

THE BOLLES SLIDING AND REVOLVING SASH has been specified for a large apartment house in Atlanta, a block of houses in Indianapolis, and for the new Court House for McDonough County, Georgia. Agencies have been established as follows: V. H. Kriegshaber, Atlanta, Ga.; F. Codman Ford, New Orleans, La.; A. L. Blair, Richmond, Va.; Harding & Whiteside, Louisville, Ky.; Wm. B. Roberts, Indianapolis, Ind.; Cyrus P. Finley, St. Louis, Mo.; George W. Laws & Co., St. Paul and Minneapolis, Minn.

A USEFUL and very interesting book is "A Mint of Hints," just issued by the American Clay-Working Machinery Company, of Bucyrus, Ohio. The book is one of the prettiest ever sent out to brick and tile makers, is printed in brown and green ink, and is enclosed in a handsomely embossed cover. In this work is given a description of the Durant hollow building block, and matter showing its superiority as a building material. There is also shown a multitude of shapes and forms of all kinds of brick.

THE GLOBE FIRE-PROOFING COMPANY, of Philadelphia, have started their new and modern plant for the manufacture of fire-proofing and brick, at Clayville, N. J. They are in the market with a beautiful line of tempered clay buff brick, and are manufacturing all kinds of flat and segmental arches, furring, partition, roof and ceiling blocks, girder and column covering. All these materials burn a beautiful buff, and are made of fire-clay. The main office is at 449 Philadelphia Bourse; Boston office, 443 Tremont Building; New York office, 412 Presbyterian Building, 156 Fifth Avenue.



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THE copartnership heretofore existing between George R. Twichell and Alfred Yates, dealers in builders' supplies at 19 Federal Street, Boston, under the name and style of G. R. Twichell & Co., has been dissolved by mutual consent. The business in future will be carried on at the same location by George R. Twichell, under the same name and style, who will assume all liabilities, and receive all accounts payable to said late firm.

CHAMBERS BROTHERS COMPANY, of Philadelphia, have recently erected and started a plant for making hollow brick, on the yard of the C. P. Merwin Brick Company, at Berlin, Conn.

Their exhibit of brick-making machinery at the Tennessee Centennial, at Nashville, Tenn., where they have erected a building for their own use, and installed about \$20,000 worth of machinery, is in operation and receiving a great deal of attention. This is one of the few machinery exhibits which was ready to go on the opening day. One characteristic feature of the Chambers machines is that when the engine starts the Chambers machine makes brick.

COLUMBUS BRICK AND TERRA-COTTA COMPANY, Columbus, Ohio, have recently secured the contracts to furnish the bricks on the following jobs: Spahr Building, Columbus, Ohio, D. H. Burnham & Co., architects; terra-cotta Roman brick to be used. High school at Urbana, Ohio, Yost & Packard, of Columbus, architects; light-gray standard brick. Townshend Hall, Ohio State University at Columbus, Peters, Burns & Pretzinger, architects; dark-gray standard bricks. Toledo High School, Toledo, Ohio, Bacon & Huber, architects; first story, dark-gray bricks; second story, buff. Henry Flish residence at Piqua, Peters, Burns & Pretzinger, architects; gray Roman bricks. Residence, Geo. H. Partridge, Minneapolis, Minn., Long & Rees, architects; dark-buff Roman. Residence of Carl Hoster at Columbus, A. A. Linthwaite, architects; gray standard brick.

THE BURLINGTON ARCHITECTURAL TERRA-COTTA COMPANY have contracted for the following work: twelve houses, Broad Street and Erie Avenue, Philadelphia, H. E. Flower, architect; addition to the Hayes Mechanics' Home, Philadelphia, Kean & Mead, architects; new office building for the Prospect Brewing Company, Philadelphia, A. C. Wagner, architect.

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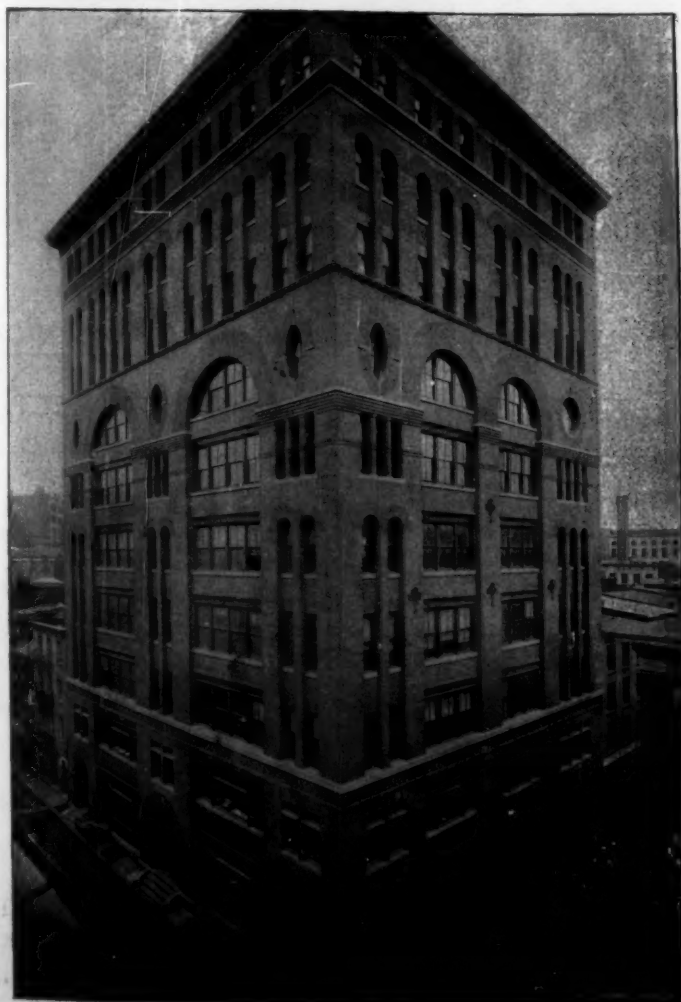
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HIDE & LEATHER BANK BUILDING, NEW YORK CITY.
Laid up with Clinton Mortar Colors.

PEERLESS**MORTAR****COLORS DO NOT FADE**Nor **WASH OUT.**

SEND FOR SAMPLES.

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ESTABLISHED 1844.

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Sole Importers in the United States of the

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The only preventative for scum and discoloration, neutralizing the Sulphate of Lime in the Clay and Water.

Also sole importers in United States and Canada of the well-known brands of Vorwohler "LION" Portland Cement and "BRUNSWICK" Asphalt Mastic.

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On account of its merit as a superior Portland Cement and its good tensile strength,

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WILL NOT RUN, FADE, OR STREAK THE BUILDING.

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Manhattan Concrete Company,Incorporated under the Laws of the
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Capital Stock, \$50,000.

HIGH GRADE WORK
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ranging in daily capacity from 20,000 to 100,000,
make bricks with less lamination than other auger
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Cunningham's Side and End Cut Auto- matic Brick Cutters;

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Fifteen sizes and styles of

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The...Cummer Dryers.

All Styles. All Sizes.

DIRECT HEAT DRYERS.

NO { Boilers,
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FOR { Portland Cement Works,
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Drying Everything.

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COMPLETE SUCCESS!

That's the verdict of the National Brick and Terra-Cotta Co.,
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G. D. BODART,
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The Standard Dry Kiln Co.
Indianapolis, Ind.

Passaic, N. J., Nov. 14th 1898

Dear Sirs:

After running your Drier for some time would say it is a
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We are making and drying 40 M soft mud brick every day that are acknowl-
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we had no trouble whatever, and would cheerfully recommend the "Standard"
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Wishing you success, we remain,

Yours very truly,

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Its adaptability to different clays has made THE STANDARD DRIER
successful where others have failed. If you have this subject under considera-
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NO DRY-PRESS BRICK PLANT COMPLETE

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Carmichael Clay Steamer.

T. W. CARMICHAEL, Inventor and Manufacturer.

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Duplicate orders are the Heralds of success.

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BRADFORD, PENN., April 16, 1897.

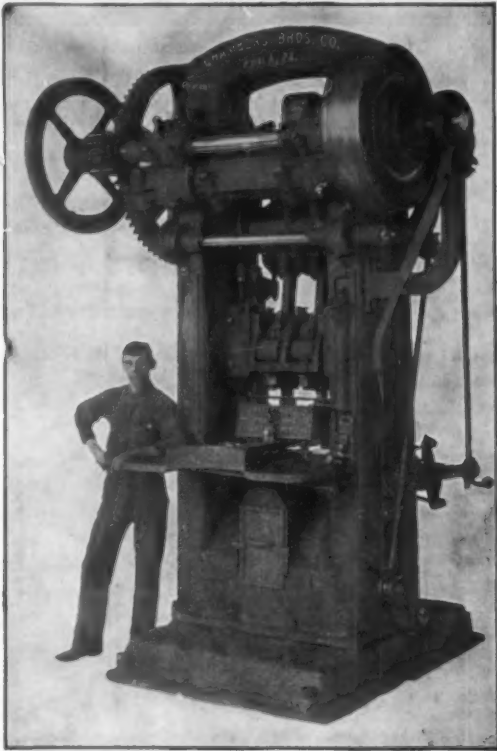
T. W. CARMICHAEL, Wellsburg, West Va.

Dear Sir:—The steamer which you placed at our No. 1 press is
entirely satisfactory, and you may send us one for our No. 2 press at
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ALUMINA SHALE BRICK COMPANY,
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Power Repress for Plastic Brick.

Weight, about 14,000 Pounds.



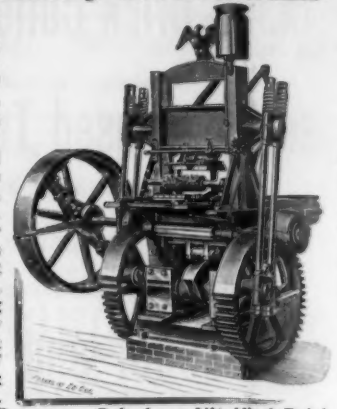
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CHAMBERS BROTHERS COMPANY, Fifty-Second and Media Sts., PHILADELPHIA.

A strong, stiff machine, with all the pressing machinery above the mold box and away from the dirt. The finished brick is delivered up on a plate, and is never touched by the incoming clot. During the initial pressure any surplus clay in the clot is expelled, and all brick thus gaged to uniform thickness, following which all openings are closed and the finishing pressure applied in a practically tight box. The product is a repressed, tempered clay brick, free from blemish arising from method of delivery, and of practically uniform density and thickness.

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That is the number of Eagle Re-Presses we have in operation in Galesburg, Ill. We don't consider 13 an unlucky number! There were 13 original States. See what a grand Nation has grown from this nucleus of 13. The American Eagle perched proudly upon the American Shield, originally screamed for but 13 stars and bars. To-day there are 45 stars upon our flag. Why, then, should we fear the omen of 13? We are proud that the Eagle of The American Clay-Working Machinery Co. should be perched over 13 of the American's Eagle Re-Presses in Galesburg. There are other manufacturers — several of them — who would be glad of the opportunity to brave the superstitious omen under similar circumstances. It's not a question of luck, but of merit. People who use the Eagle Re-press are pleased with it. When they enlarge they buy another, and so it goes. In Galesburg the 13 Re-Presses are, every one, giving the best of satisfaction. That's the way with all our machinery. You buy it and are satisfied — not only to-day, but next year and the next decade. Write any one of the following Galesburg people, and see how they like the Eagle Re-Press: Purington Paving Brick Co., 7 Presses. Galesburg Brick & Terra-Cotta Co., 3 Presses. Galesburg Paving Brick Co., 2 Presses. Galesburg Vitrified Brick Co., 1 Press. Don't forget that we've got THIRTEEN running at Galesburg, Ill. We've just issued a new description of the EAGLE RE-PRESS. IF YOU WANT IT, WRITE US.



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NEW YORK OFFICE,
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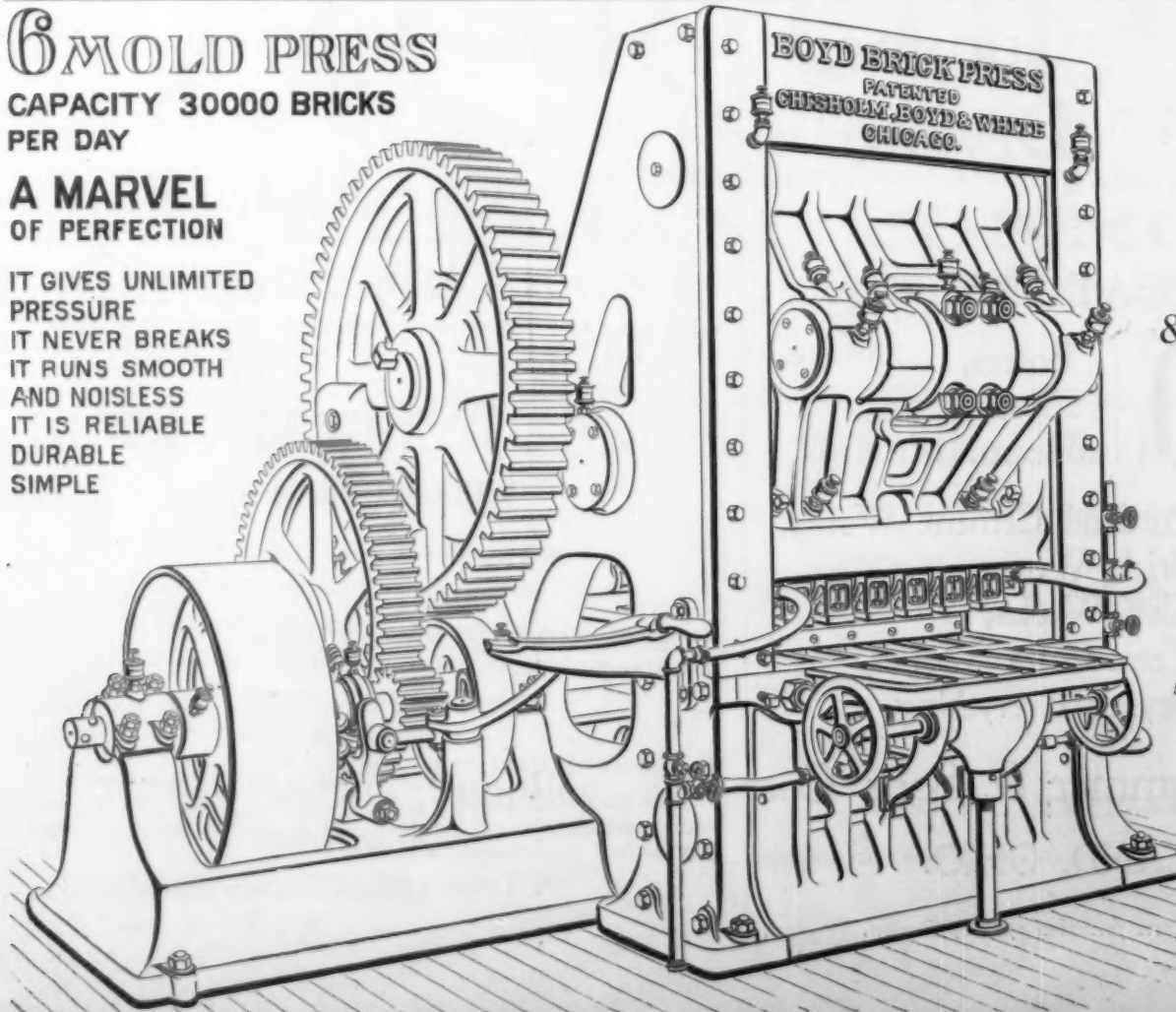
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CAPACITY 30000 BRICKS
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A MARVEL
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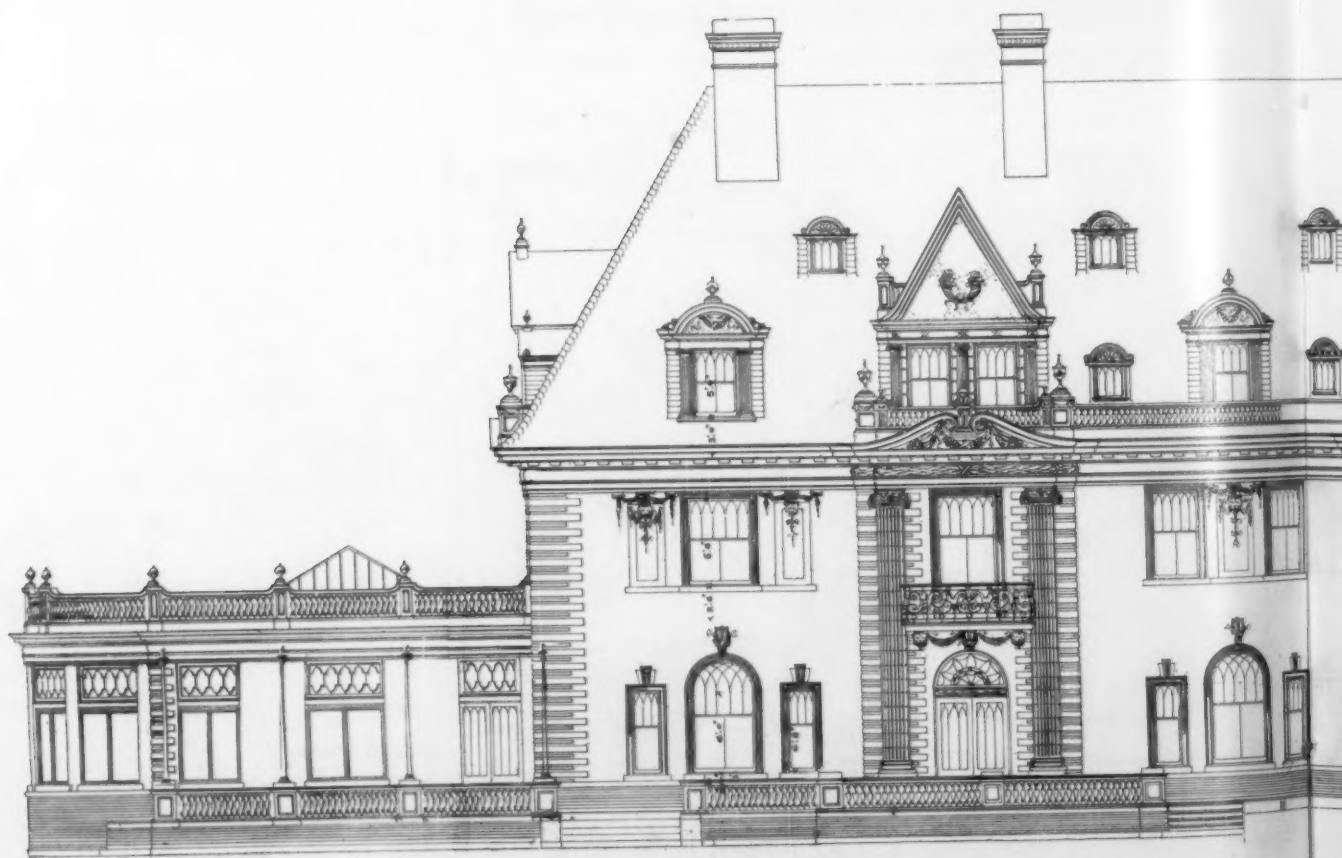
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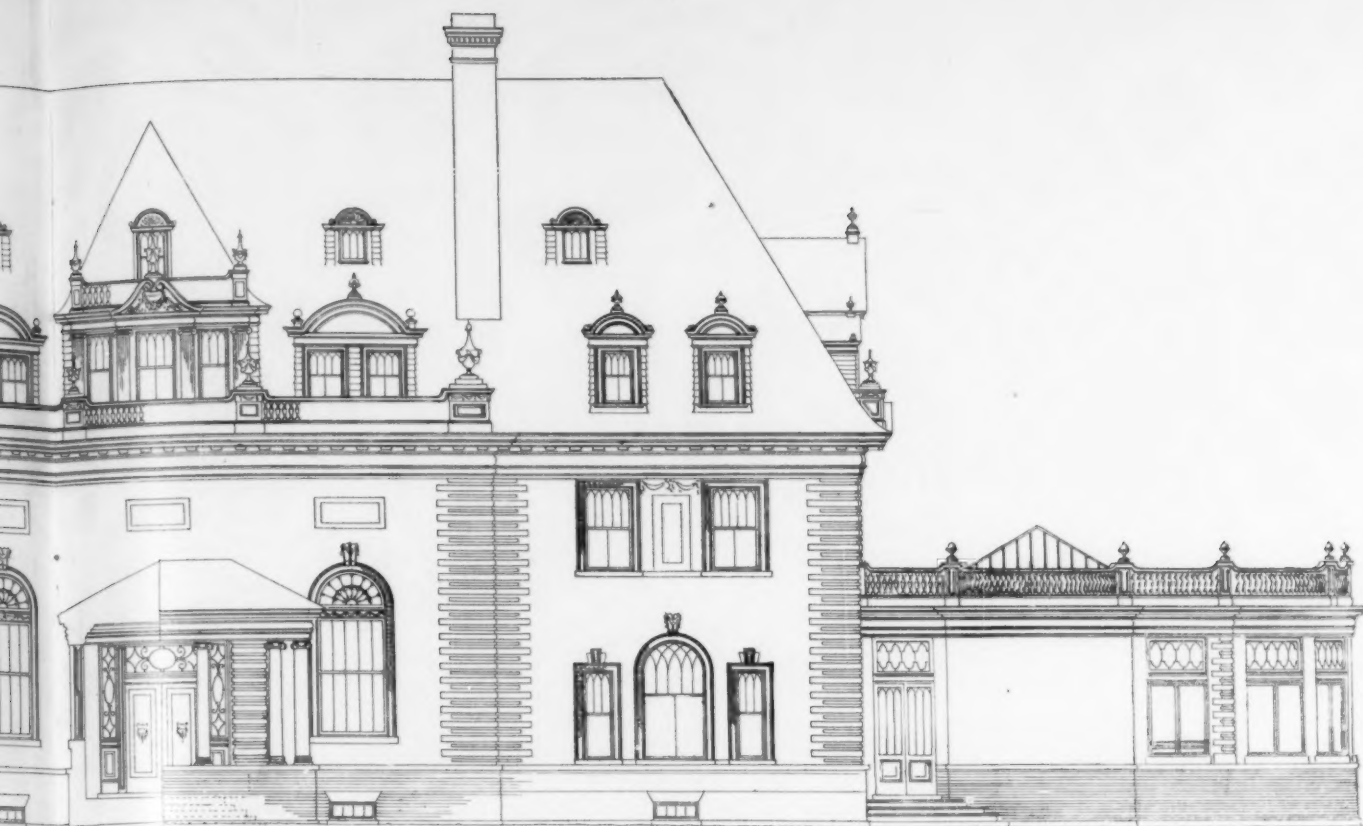


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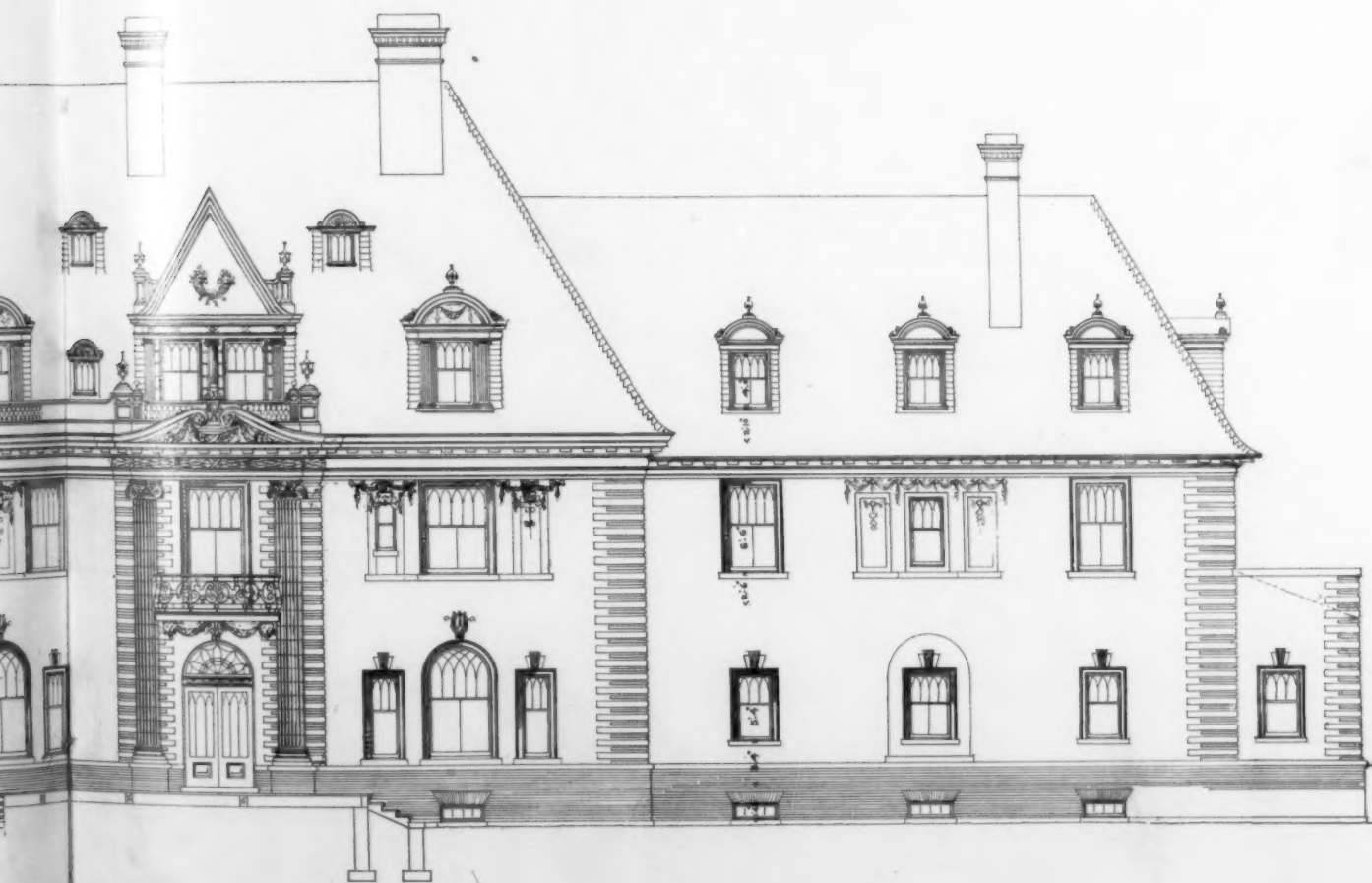


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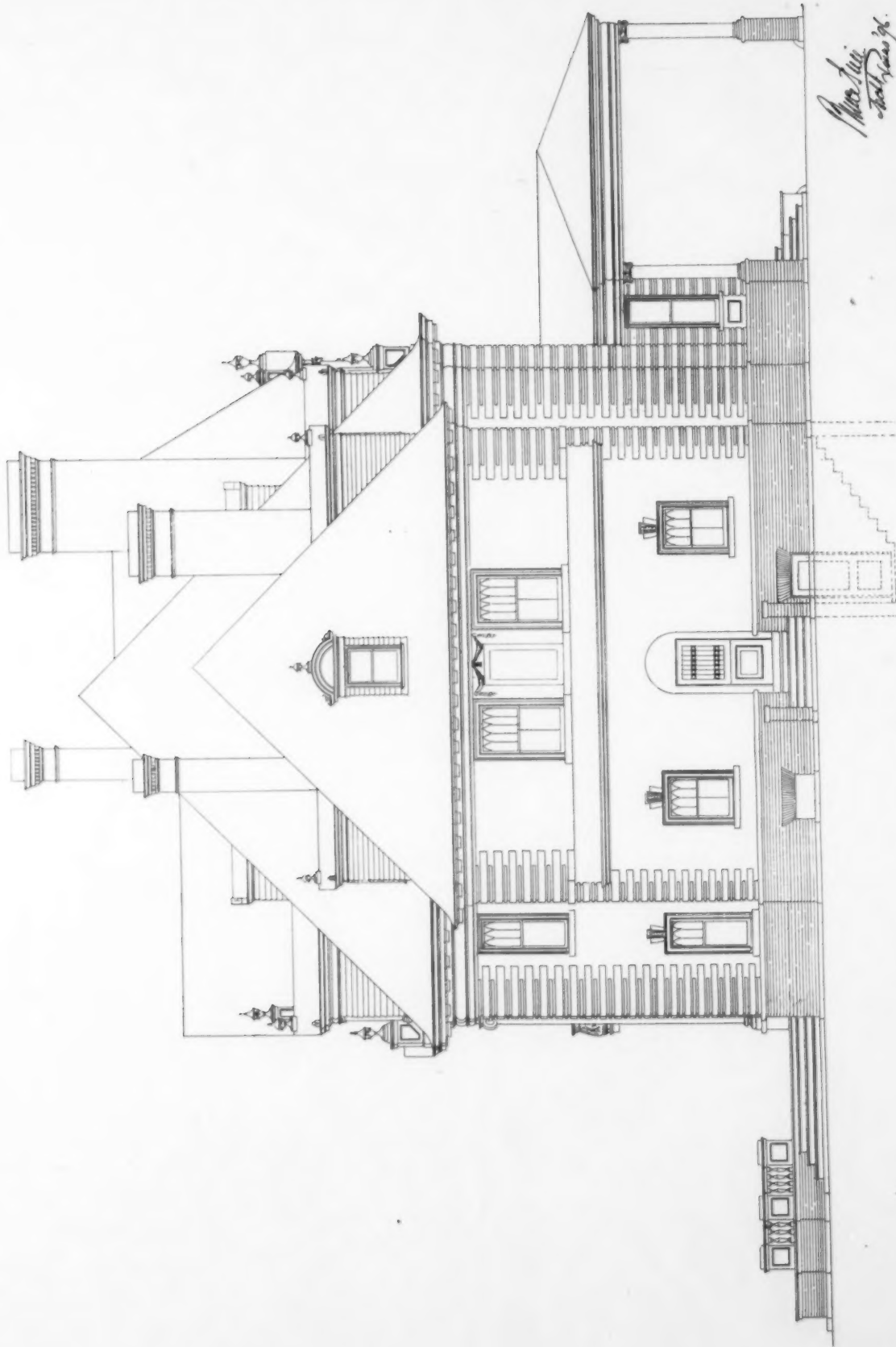
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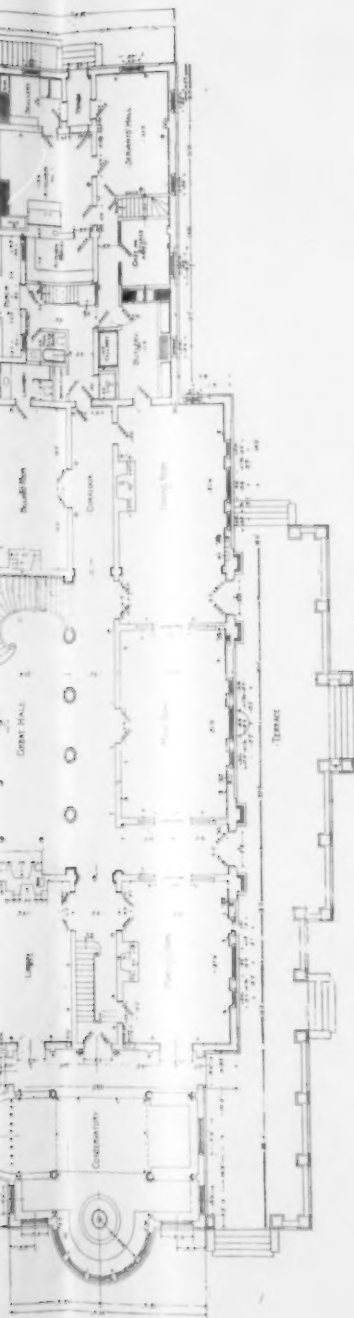


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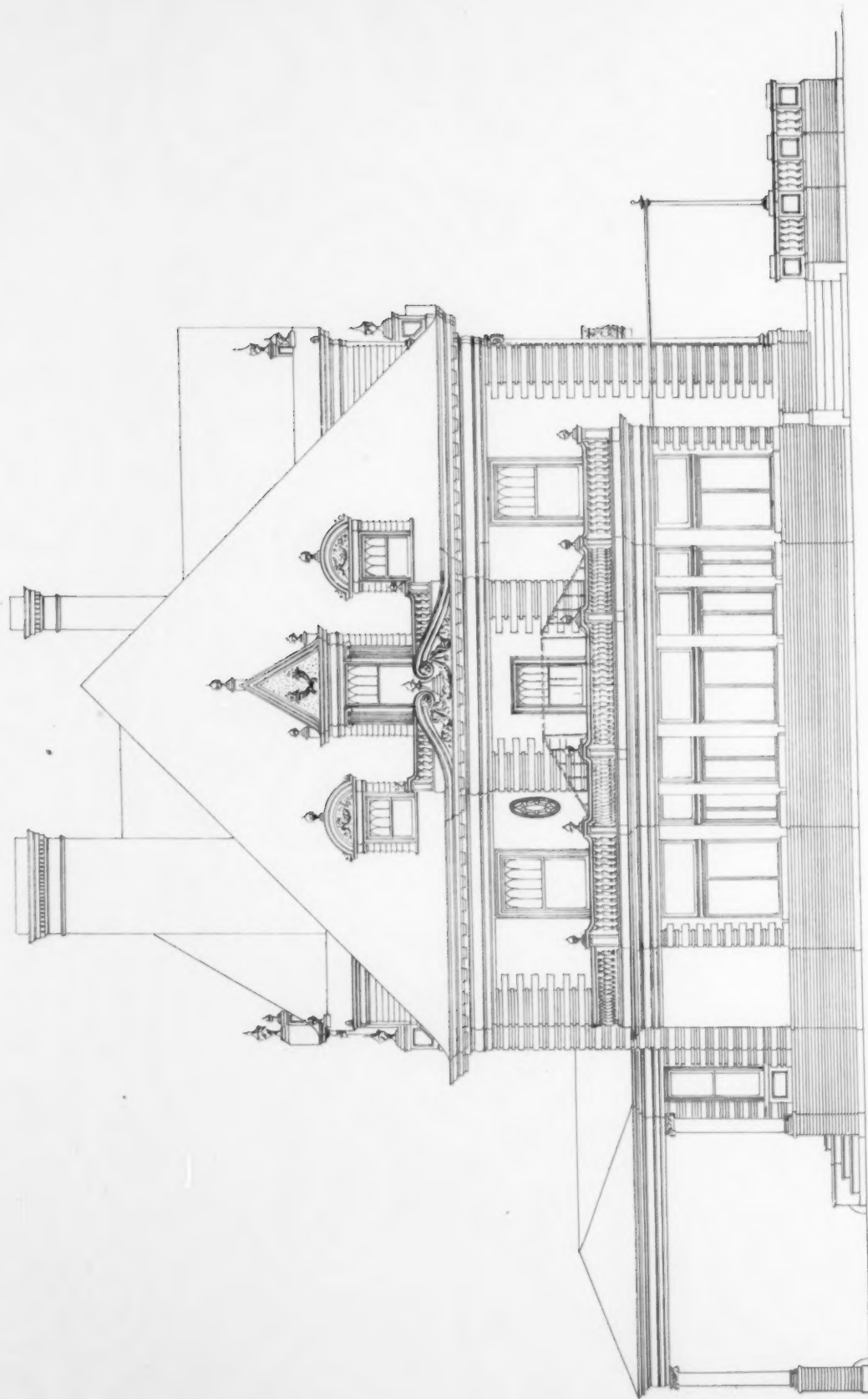


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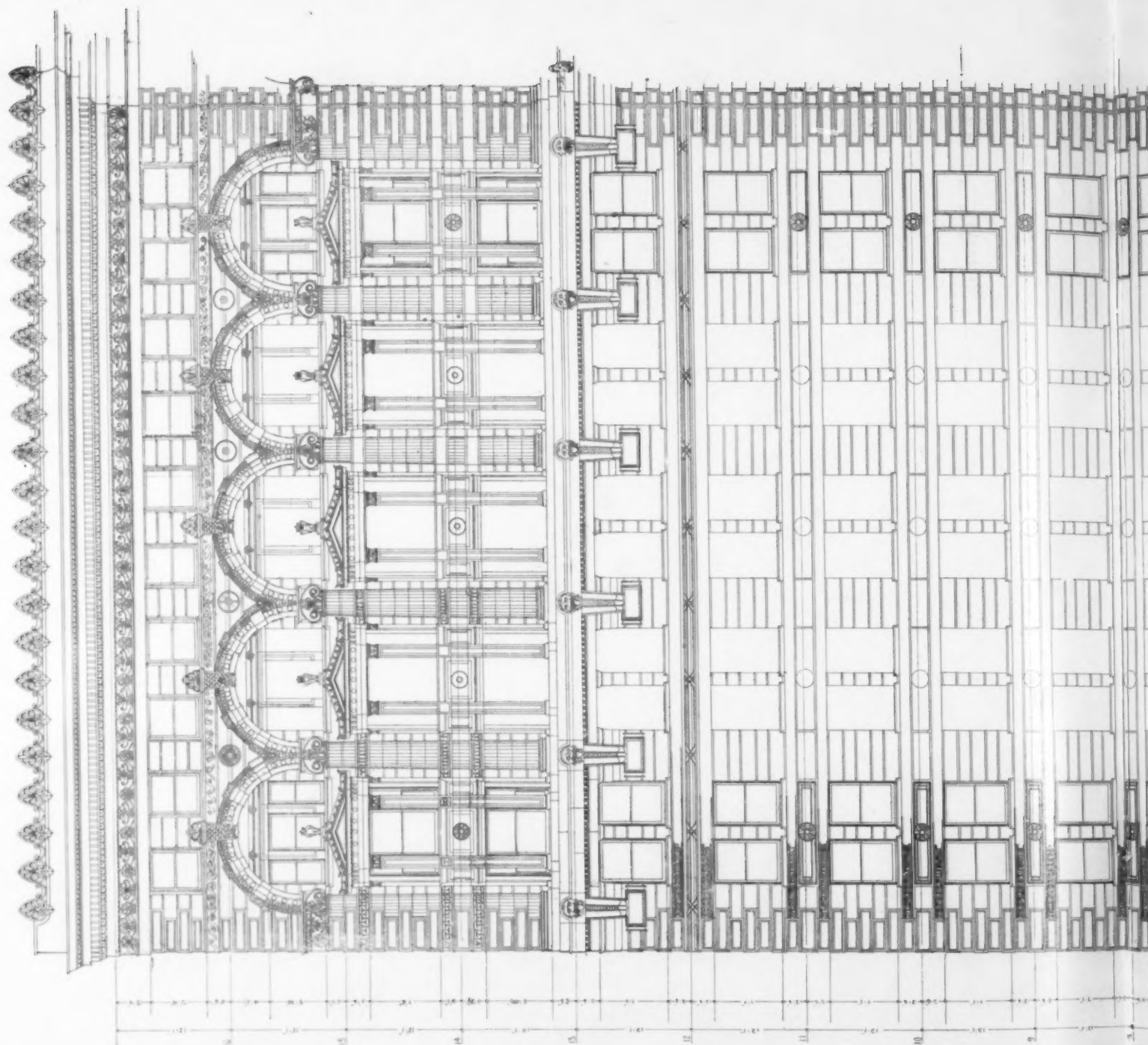


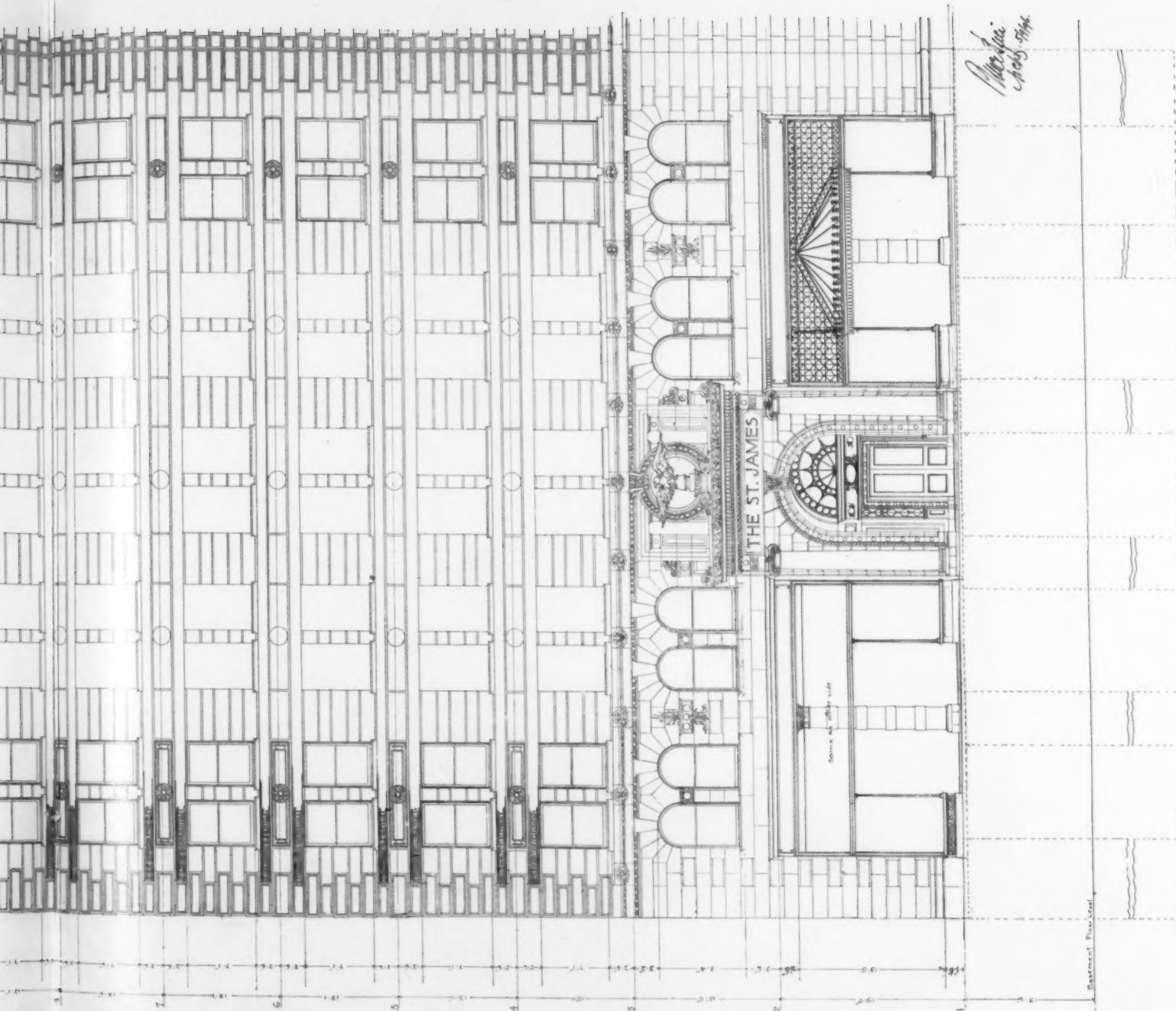


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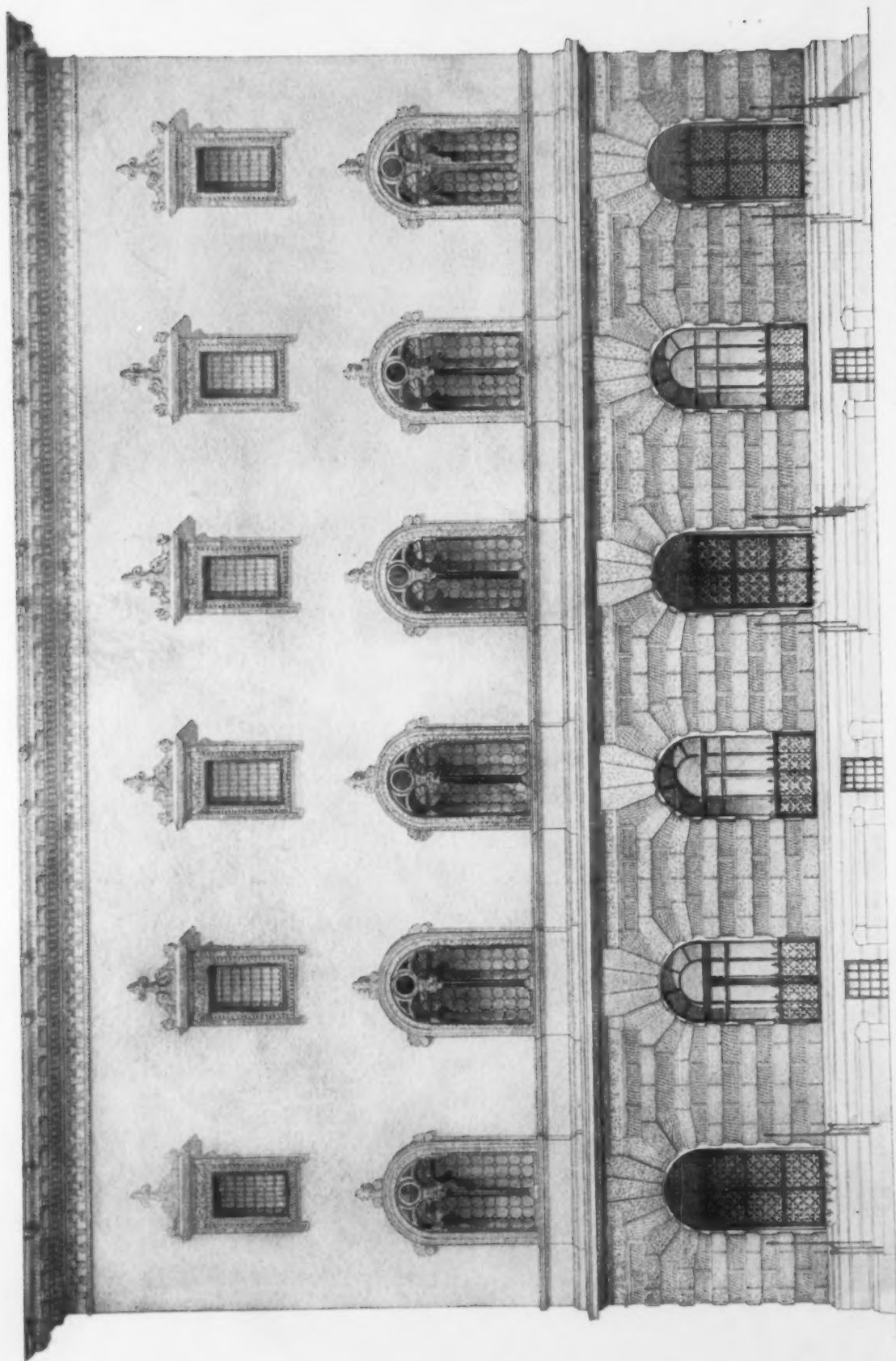


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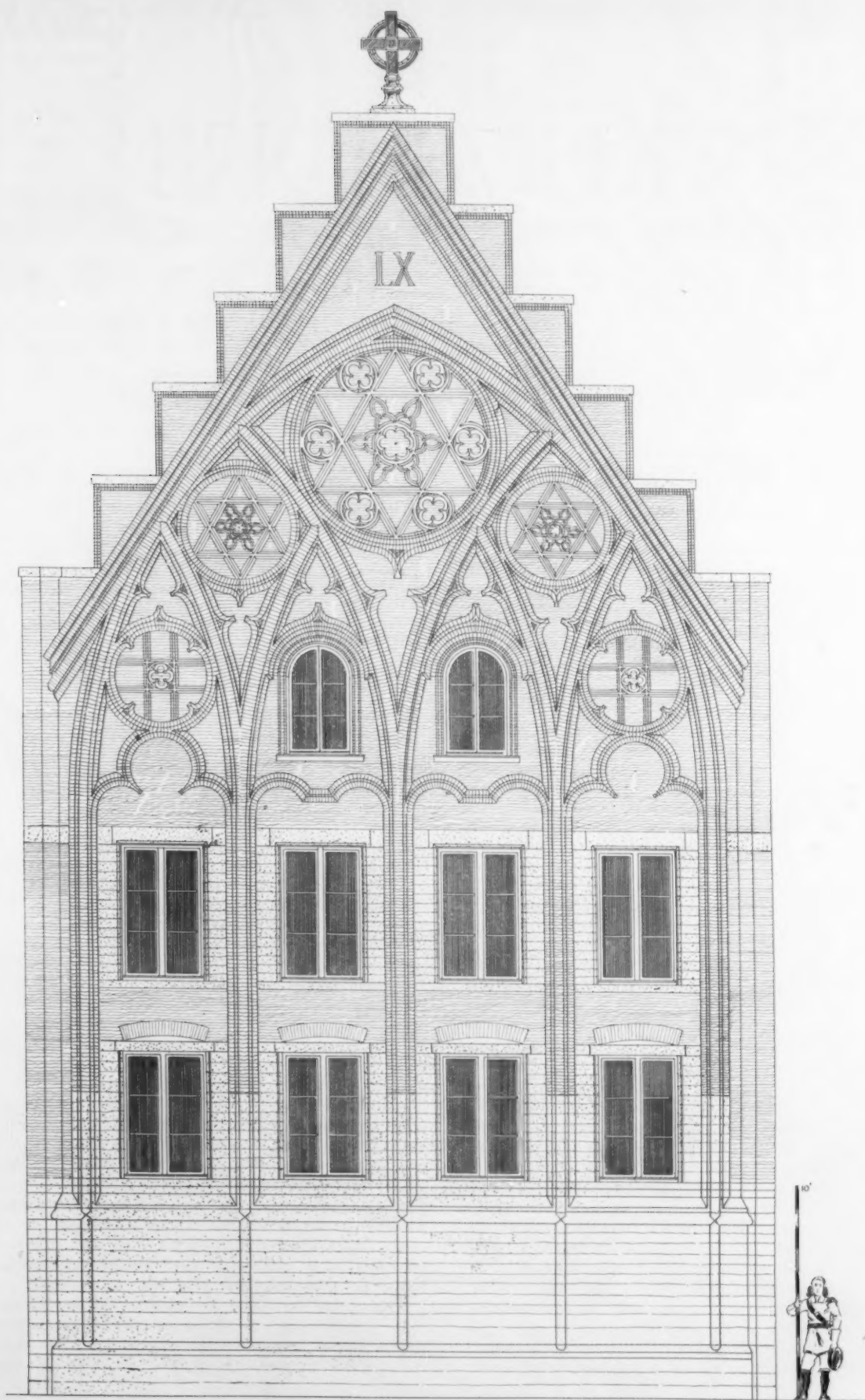


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